Digitized by the Internet Archive
in 2018 with funding from
University of Toronto

https://archive.org/details/medjournalJan1939uoft

THE UNIVERSITY OF TORONTO
MEDICAL JOURNAL
(An Undergraduate Publication)

This Journal is published six times a year, November to April, by the Medical Society of the University of Toronto, to serve as a medium for student expression and to bring to the student recent articles of scientific interest.

$1.50 per volume. 25c. per single copy.

Circulation 1,100.

ADVISORY STAFF.

Prof. E. A. Linell, M.B., Ch.B., M.D. Manc.
J. Harold Couch, M.A., M.B., F.R.C.S. Edin., F.R.C.S. (C.).
H. H. Hyland, M.D., M.R.C.P. (Lond.), F.R.C.P. (C.),
D. Y. Solandt. M.A., M.D.
Prof. G. F. Marrian, D.Sc., Lond.

EDITOR-IN-CHIEF
J. H. Belton, '39.

ASSOCIATE EDITOR
K. C. Greer, B.A., '40.

MANAGING EDITOR
N. L. Hillary, '41.

ASSISTANT EDITORS
G. E. Wodehouse, '40; T. S. Wilson, '41.

WOMEN'S EDITOR
Miss D. E. Redmond, '39.

FEATURE EDITOR
J. C. McCulloch, '39.

ABSTRACTS EDITOR
D. H. Copp, '39.

CIRCULATION STAFF
Manager—D. L. Campbell, '39.
Assistants—
W. O. H. Perry, '39. C. W. Parker, '42.
E. M. J. FitzHenry, '40. J. B. Armstrong, '43.
A. J. Denne, '41. J. C. Jones, '44.

Address all communications to Room 107, Anatomy Building.

Vol. XVI Toronto, January, 1939 No. 3

Editorial

Recently the English penny press reported rumours that Colonel Charles A. Lindbergh was going to have his heart removed and replaced by an indestructible one from Dr. Alexis Carrel's stock. Such a statement is hardly more amazing than the experiments being carried out at the Rockefeller Institute for Medical Research in Manhattan.

For the past eight years Carrell and Lindbergh have been perfecting a technique for the culture, not of such simple structures as tissues, but of organs. The story of Lindberg's life is well known but that of Carrel, which is more interesting to the medical profession, is relatively unknown.

Alexis Carrel was born in Lyons, France, and attended the medical school of that city. After graduation his ideas on research met such opposition that he gave up medicine and came to French Canada to raise cattle. Fortunately, he was persuaded to return to medicine and shortly afterwards he met Dr. Simon Flexner, who was organizing the staff of the newly-formed Rockefeller Institute for Medical Research. Flexner, a genius at choosing men, invited Carrel to join the staff of the Institute.

Carrel's career has been one brilliant step after another. In 1912 he was awarded the Nobel Prize in Medicine for his work on the surgery of blood vessels, this being the first time the award had been given to an American.

During the war there was great loss of limb and life due to the massive infection of wounds. Carrel, working with Dakin, evolved a technique for the sterilization of infected wounds, thereby evercoming the terrific mortality of war wounds. The saving of life by this technique is beyond appraisal. Carrel's little book entitled "Infected Wounds" is a medical gem, and the introduction in which he refutes the arguments of the profession that wounds could not be sterilized is a delight to read.

After the war Carrel once again became engrossed in tissue culture. Twenty-four years ago he cultured a piece of heart from a chick embryo and clippings of this are still alive today. Indeed if it had been possible to feed the growing protoplasm, its bulk would now equal that of the sun! The results of these long years have been recently published in a book entitled "Methods of Tissue Culture" by Carrel's assistant, R. C. Parker.

But Carrel was not satisfied with the culture of simple tissues. He knew that the whole body did not die at the same time and that if a circulation were supplied to the remaining viable parts, their life could be greatly prolonged. This dream has occupied men's minds for over a century. Le Gallois, a French physiologist, wrote in the year 1812, "If one could substitute for the heart a kind of injection of arterial blood, either natural or artificial, one would succeed easily in maintaining alive indefinitely any part of the body whatsoever."

Carrel has succeeded in this but it has not been so easy as Le Gallois thought. There were three great problems to solve. The first problem of removal and replacement of the organs was solved by Carrel's knowledge of the surgery of blood vessels and his amazing dexterity (it is said that using only his fingers he can tie knots inside a small match box). The next problem of infection was solved by the knowledge gained in treating infected wounds during the war. The last problem was to obtain a perfusion pump that would simulate the heart's action, supply nutriment, remove waste products, and yet keep the organ sterile. After five years of experimentation Lindbergh designed a pump which fulfils all these requirements.

But what does all this mean? This question can be best answered by quoting Dr. Carrel's recent book, "The Culture of Organs," as follows:

"The method of tissue culture and that of the culture of whole organs have provided us with the means of . . . studying the food requirements of each cell type and of each tissue while active and at rest. Thus will be discovered the nature of the specific chemicals demanded by a given organ for its growth and normal function. Perhaps it may then become feasible to supply the living body with the substances indispensable to the development of any organ, or to its regeneration. Instead of injecting hormones into a patient, we would supply the glands with appropriate nutrient substances and induce them to develop, or to regenerate, and again to secrete hormones. To bring about the regeneration within the pancreas . . . would be a far more efficient method of treating diabetes than to inject insulin daily into the body of the patient. . .

"From this moment (we are) opening to experimental investigation a forbidden field: the living human body . . . When larger apparatus are built, entire human organs, such as pancreas, suprarenal, thyroid, and other glands . . . would manufacture in vitro the substances supplied to-day to patients by horses or rabbits.

"The construction of larger pumps may lead to other applications of the method. For instance, diseased organs could be removed from the body and placed in the Lindbergh pump as patients are placed in an hospital. Then they could be treated far more energetically than within the organism, and if cured, replanted in the patient. A thyroid extirpated in the course of an operation . . . a kidney removed for tuberculosis, or a leg amputated for osteosarcoma, would perhaps heal under the influence of an artificial medium when living in vitro. The replantation would offer no difficulty, as surgical techniques for the suture of blood vessels and the transplantation of organs and limbs were developed long ago."

FUNDAMENTAL PRINCIPLES OF NUTRITION AND THEIR PRACTICAL APPLICATION.

By FREDERICK F. TISDALL, M.D., F.R.C.P. (C.)
Associate in Paediatrics

Nearly a hundred years ago, Graves wrote, "Want of a sufficiency or food of an unwholesome or an improper chracter predisposes the human frame to disease by its debilitating effect on the system."

To maintain life, your food must include no less than 32 different food substances, and to enjoy the highest level of health, these food materials must all be present in the diet in proper amount Tremendous progress has been made in our knowledge of the principles of nutrition during the last twenty-five years, but unfortunately the acquisition of this knowledge has far outrun its practical application in everyday life. The public is more and more turning to the medical profession for this knowledge, and if the medical profession does not give it, the public then turns to the various faddists and other unscientific sources for information.

Of the 32 food elements necessary for life, 10 are amino acids, obtained of course from proteins. This does not include all the amino acids known, but recent work by Rose has shown that 10 are essential for life. There are 13 essential minerals, the most recent one discovered being cobalt; 7 vitamins, the most recent one dscovered being nicotinic acid, carbohydrate for energy, and fat also for energy and on account of its essential linoleic acid. This adds up to a total of 32.

The practical application of this knowledge is not as difficult as might appear at first glance, particularly if we consider the requirements under the five fundamental groups, namely, carbohydrates, fats, proteins, minerals and vitamins.

Carbohydrates

Carbohydrates are used largely to supply energy, so we must first consider what are the caloric requirements of the average individual. In a dietary standard laid down by the Canadian Council on Nutrition, the following figures were set out:

INFANTS	
At one month of age	500 calories
At six months of age	800 calories
At one year of age	1,000 calories

CHILDREN	Girls.	Boys.
From end of 1st year to end of 3rd year	1,250 cals.	1,400 cals.
From end of 3rd year to end of 6th year	1,650 cals.	1,900 cals.
From end of 6th year to end of 10th year	2,000 cals.	2,200 cals.
From end of 10th year to end of 12th year	2,250 cals.	2,400 cals.
From end of 12th year to end of 15th year	2,500 cals.	3,200 cals.
From end of 15th year to end of 18th year	2,500 cals.	3,600 cals.

ADULTS	
Women—	
No manual work	2,000 calories
Housework, or similar	2,400 calories
Pregnant, no manual work	2,400 calories
Pregnant, with housework	2,800 calories
Nursing	3,000 calories
Men—	
No manual work	2,400 calories
Light manual work	2,800 calories
Moderate manual work	3,300 calories
Hard manual work	4,200 calories
Very hard manual work	5,000 calories

It is obvious that the caloric requirements vary almost directly with the manual work or effort put forth by the individual, and if food is available the amount consumed is usually governed to a large degree by the appetite of the individual. Sometimes for economic reasons the individual is unable to purchase sufficient food; also through a desire of young people to be underweight they actually consume an insufficient number of calories. On the other hand, many people with a great desire for food consume too much. Tables of food values in terms of average servings should be kept available by every physician so that if necessary he can with very little effort on his part determine the number of calories being consumed by his patients. It is usually only necessary to do this, however, in instances such as mentioned above, as the vast majority of people consume the number of calories required.

Unfortunately the chief sources of carbohydrates ordinarily consumed are purified flours and purfied sugars. The word "unfortunately" is used advisedly, because in the process of purification a large proportion of the other food elements which were orginally present in the raw product have been removed. The strain put on the remaining portion of the diet to supply these food elements is readily recognized when it is found that in the average diet of the medical student no less than 35 to 50 per cent. of the calories taken each day are from purified food sources, such as white flours used in making cakes, pastries and bread, and purified sugars such as sugar, sweets, jams, marmalade and corn syrup. One does not perhaps realize the large number of calories which are consumed in our common articles of food made from these purified food products. For instance, 3 slices of bread with butter furnish 400 calories, and one average helping of pie made with the usual amount of sugar and pastry will furnish no less than 500 to 700 calories. To get 500 calories in the form of milk would require one and a quarter pints; as meat, slightly under 1 pound; as potato, no less than 6 cupfuls, and as cabbage, 10 cupfuls. A little thought, with the above in mind, brings home the fact that in regard to carbohydrates to-day, our chief worry is to see that we do not get too much of them and thus crowd out the other essential articles of food.

Fat.

Carbohydrates and fats are interchangeable to quite a degree as a source of energy, but from a practical standpoint it has been found essential to see that 30 per cent. of the total calories are furnished in the form of fats. As already mentioned, fat also contains an acid essential for life itself. Our best sources of fat, of course, are butter and the fat of milk, as they contain some of the fat soluble vitamins in large amounts. The next most valuable source is animal fat, such as lard. The cheapest is vegetable oils which are usually devoid of vitamins. The practical point to be remembered, however, is that the fat needs of the body will be largely met if the diet contains from 2 to 3 ounces of fat a day.

Proteins.

To supply the protein needs of the body about 12 to 15 per cent. of the total calories should be in this form. Animal protein is better utilized by the human than proteins from grain or vegetable sources, and it is usually considered that of the protein consumed 50 per cent. should be from animal sources. We rarely see in children any lack of protein, due to the fact that if the proper amount of milk is consumed this alone will furnish a large proportion of the protein needs.

Minerals.

Of the 13 minerals there are only 3 which we have to watch carefully. If the diet is at all reasonable, the other

10 will be supplied. The 3 minerals we have to watch are calcium, iron and iodine.

Our chief source of *calcium* is milk, in fact without milk it is impossible to outline a diet for children which would supply the proper amount of calcium. It is usually considered that for the average child at least 1 gram of calcium is required daily to enable the bones and teeth to grow properly. This amount of calcium is supplied by one and one-half pints of milk. The amount present in other foods, with the exception of cheese, is negligible. In the accompanying table is given the amount of some of the common foods necessary to supply 1 gram of calcium. In analyzing many children's diets, it is found that milk furnishes approximately 75 per cent. of the calcium intake of children. It is recommended that the small child receive from a pint to a pint and a half of milk daily; the rapidly growing child of 12 to 17 years of age, from a pint and a half to a quart of milk daily, and the adult, one-half pint of milk daily. The amount of calcium usually considered necessary for the adult varies from 550 to 700 milligrams daily, and unless some milk is included in the diet it will be found that the average intake of calcium is 300 to 400 milligrams instead of the above mentioned figure. Due to our custom of drinking tea or coffee at every meal, it is obvious that many adults do not receive the optimum amount of milk. One further point to be kept in mind in speaking of calcium is that one is not concerned whether the milk is taken as a beverage or is used in the cooking.

Amount of some common foods Necessary to supply 1 gram of Calcium.

Milk	1½	pints
Cheese	4	ounces
Chard	1½	lbs.
Cauliflower	2	lbs.
Celery	3	lbs.
Spinach	3	lbs.
Cabbage	5	lbs.
Lettuce	5	lbs.
Oatmeal	3	lbs.
Bread	8	lbs.
Beef	17	lbs.

Our best sources of *iron* in foods are vegetables and fruits, egg yolk, liver and kidney.

Iodine is present in sea-foods, but as seafoods are not a regular article of food in many sections of the country, our best and most economical source of iodine is iodized salt.

If the diet contains each day for the child, about 1½ pints of milk; for the adult, one-half pint of milk, two average servings of vegetables besides potato, and some animal source of iron, such as egg yolk, liver or kidney, plus the use of iodized salt, our patients will then be getting an adequate supply of calcium, iron and iodine. As already mentioned, the other 10 minerals are properly supplied with any reasonable diet.

Vitamins.

Fat soluble *vitamin A*, or its precursor carotene is widely and abundantly distributed. It is found in comparatively large amounts in milk, cream, butter, colored vegetables such as carrots, spinach, lettuce, and in egg yolk, liver and kidney. If the diet is at all reasonable and includes each day some milk, some butter, some vegetables and an egg, your patient will be receiving an adequate amount of vitamin A.

The story in regard to water soluble *Vitamin B*1 is entirely different. This vitamin, although widely distributed, is not abundant in most foods. The most concentrated source in foods is wheat germ, but unfortunately in our milling process this part of the grain is carefully removed and used for animal feed. Yeast is also a good source of B1, but yeast can hardly be con-

sidered an ordinary article of food. Of the various vegetables and fruits, probably peas and beans are the best sources. They also have the advantage of being comparatively cheap. Most vegetables and fruits contain some vitamin B1. It is also found in milk, eggs and liver and kidney. Strange to say, pork is a very fair source of this vitamin. Due to the fact that this vitamin is water soluble, a very serious loss can occur during cooking if an excess of water is used and the cooking water poured down the sink. This is one of the reasons why vegetables should be cooked with a minimum amount of water and if possible the water saved for use in soups.

The role of *riboflavin,* one member of the vitamin B2 complex, in human nutrition is not clear. However, in animals, if this vitamin is left out of the diet, they soon cease to grow and die. It is hardly conceivable that a substance so essential for practically all animals is not also essential for human nutrition. Its distribution is essentially the same as that of vitamin B1, except that it is present in much larger amounts.

The most recently discovered vitamin is another member of the vitamin B complex, namely, *nicotinic acid.* The importance in human nutrition of this chemical substance, which has been known for some 75 years, was first demonstrated about a year ago. Spectacular results are obtained in the treatment of patients with pellagra by the oral administration of nicotinic acid. Its exact distribution in foods has not as yet been worked out, but it is probably present in milk, eggs, liver and kidney, whole grain cereals, and yeast.

A lack of *vitamin C* results in the disease scurvy. If foods are cooked for any length of time this vitamin is destroyed by oxidization, which is one of the reasons why the diet each day should include some raw fruit or vegetables. With infants and children, of course, the best source of vitamin C is orange juice, 1 to 2 ounces daily, or factory canned tomatoes. In the canning process the cooking is done in the absence of air, so the vitamin C content of canned tomatoes is just as high as the raw product.

Scurvy is quite uncommon now, but a few years ago, before the need for raw fruit in the diet of infants was recognized, it was quite prevalent. The initial signs and symptoms in babies from 4 months to a year and a half of age are pain on being handled and the child not moving its legs, which is due to the pain. In a week or so this is followed by hemorrhage in the gums around the teeth which have erupted or are beginning to erupt. The hemorrhage produces a purplish spongy mass at the junction of the teeth with the gums. This tendency to hemorrhage may evidence itself elsewhere in the body by bleeding from the gastro-intestinal tract; occasional microscopic evidence of hemorrhage is seen in the urine, or petechia may be seen in the skin. Hemorrhages also occur under the periosteum at the ends of the long bones, so that enlargement at the ends of the long bones may be felt. This enlargement should never be confused with arthritis, as the enlargement is just a slight distance away from the joints. The subperiosteal hemorrhage will not show up in the X-ray until about 10 to 14 days after the institution of vitamin C therapy. However, the X-ray appearance of the bones in scurvy is quite typical. At the ends of the long bones there is a distinct white line. A similar white line also encircles the epiphyses, giving a halo-like appearance.

Vitamin D is essential for the prevention of rickets, a disease of infancy and early childhood characterized by lack of deposition of calcium salts in the bones. The signs of the disease are sweating about the head, relaxation of the muscles and ligaments so that the abdomen is large; the chest appears relatively small, with Harrison's sulcus becoming evident; enlarge-

ment of the junction of the cartilages and the ribs, the so-called rachitic rosary; enlargement of the frontal and parietal bosses, with delayed closure of the anterior fontanelle, giving the "hot cross bun" appearance of the head or the prominent forehead of rickets; enlargement at the ends of the long bones (epiphyses), and deformities of the bones usually producing bow-legs or knock-knees. The X-ray of the long bones in rickets shows a flaring at the ends of the long bones, with irregular fringing and cupping. This disease is readily prevented by the routine administration of vitamin D in the form of cod liver oil (2 or 3 teaspoons daily), or a high potency fish liver oil, such as Oleum Percomorphum (5 to 10 drops daily), or viosterol (5 to 10 drops daily). It should be remembered that the fish liver oils supply in addition to vitamin D large amounts of vitamin A. This should be started at 2 to 3 weeks of age and continued not only throughout infancy but certainly throughout childhood, and there is some evidence that vitamin D is of value during the winter months even throughout adult life.

Vitamin D is not present in appreciable amounts in ordinary foods. For instance, it would take over 1,500 servings of spinach to give the vitamin D equivalent of 1 teaspoon of cod liver oil. Fourteen egg yolks, as purchased in the open market in Toronto, have the vitamin D equivalent of 1 teaspoon of cod liver oil. About 1920, it was shown that exposure to summer sunshine produced the same beneficial effect as the oral intake of fish liver oils. This has been later shown to be the result of activation by the ultraviolet rays of sunshine of traces of cholesterol in the skin. As far as infants and children are concerned, however, we can only depend on summer sunshine as a source of vitamin D for three months, namely, from the middle of June to the middle of September. For the other nine months in Canada it is usually impossible to expose a sufficient area of the child's skin to be sure that he is getting the desired vitamin D effect. Most foods contain traces of another substance known as ergosterol, which is the corresponding substance in plants to cholesterol in animal tissue. When ergosterol is exposed to ultraviolet rays from a mercury vapor lamp, it is changed into vitamin D. This is the basis of the manufacture of viosterol. Certain foods are now irradiated or exposed to ultraviolet rays as a result of which they contain vitamin D. The most widely available sources of irradiated foods are irradiated milk and vitamin D bread.

Vitamin E. The fat soluble vitamin E has been shown to be essential for reproduction in many species of animals. However, it was reported last year that many generations of goats were raised on diets containing no vitamin E. Its exact place in the human dietary is still open to question, but there is considerable evidence that many cases of habitual abortion can be prevented by the administration of this vitamin. It is contained in milk, eggs and various vegetables and fruits. Wheat germ oil is an excellent source of this vitamin.

In the above paragraphs are given many of the fundamental principles of nutrition. One should keep these in mind in conducting the average medical practice. Too often the physician sees a sick patient and treats only the acute illness, forgetting completely that a lack of any one of these food elements will lower resistance to infection. Also, in the treatment of many chronic illnesses the physician's attention is so centred on the disease itself that he forgets to treat the body as a whole and see that the patient is adequately nourished. There is no question that the physician to-day can perform a very real service to all his patients by checking in every case the diet and seeing whether it is adequate or not. With the average patient it is not necessary to go into great detail. One can check to see whether the diet

is built up around a half pint of milk for the adult or a pint and a half for the child daily, an egg a day, some meat, two liberal helpings of vegetables besides potatoes daily, some raw fruit or vegetables, and in the winter-time some source of vitamin D. If this is done one will be taking at least one step towards that goal which we all desire, namely, optimum health.

THE SCOPE OF PLASTIC SURGERY

By STUART GORDON, M.D., F.R.C.S. (Can.)
Fellow in Surgery

The art of plastic surgery is not new. It was practised, in the upper reaches of the Sind, at least as early as 3000 B.C. A monograph on nasal reconstruction was published in Italy in 1497. Yet the great war of 1914-1918:— (a few years ago we would have written simply the great war!) provided such a vast amount of material that plastic surgery obtained firm root in general surgery, later to flower as a definite specialty.

The adjective plastic is probably not the most descriptive. Various attempts have been made to improve upon the term. Thus we hear of reconstructive surgery, and of structive surgery. None is quite satisfactory. Many orthopaedic operations are just as truly reconstructive. Plastic as a definitive term denoting a special branch of the art of surgery is so firmly implanted in the minds of laity and profession alike that it is doubtful if it will ever be replaced.

Just what is meant by plastic surgery is but poorly understood by many. To some it means surgery as done by the absolute purist who refuses to do destructive surgery, but only repairs the defects produced by others; to others it means charlatanry thinly disguised. It is my purpose to outline what is considered the present day field of surgery connoted by the word plastic.

Fundamentally plastic surgery is based on the transplantation of tissues. Skin, mucous membrane, fat, fascia, muscle, tendon, cartilage, and bone are the materials with which attempts are made to restore the deformed or injured patient to a condition as nearly normal — in function and appearance — as possible.

Congenital defects supply the first group of conditions requiring plastic repair. Cleft palate, hare lip, faults in union resulting in facial clefts, deformed ears, webbed fingers, and hypospadias are examples of this group. Re-arrangement of tissues in the region affected is effective in repairing many of these defects. At first content with accurate anatomical restoration, greater importance is being placed to-day on improved function. For example, a perfectly repaired cleft palate is of little value to the individual unless there is also improvement in speech. This has been appreciated by many surgeons, and, as a result, various methods of repair have been suggested to achieve this end. All aim at enabling the patient to close the oro-pharynx from the naso-pharynx during phonation. Thus while Dorrance pushes back the soft palate in attempting this, Wardill seeks to increase the bulge of Passavant's tubercle.

A hairy mole is a congenital lesion which, particularly if on the face, calls for plastic repair. Here it is usually necessary to transport skin from some area remote from the face.

Accidents result in many cases requiring plastic repair. The labourer who nips off the end of his finger may be saved further amputation by a small free graft of skin. Occasionally it is possible to remove the subcutaneous tissues from a torn flap and replace the

skin as a full thickness graft. The stump of a traumatic amputation of the hand may be covered by an immediate pedicle graft from the abdomen. Scalping injuries may be repaired by some type of free graft. Facial lacerations require careful approximation to minimize deformity.

Fractures of the facial bones fall in the category of cases included under plastic surgery. Thus the treatment of fractures of the malar-zygomatic compound, nose, maxilla, and mandible comes under the heading of plastic surgery. Here not only is restoration of position and function important but the appearance of the patient must be considered. Untreated, or inadequately treated, old fractures may require bone grafting (nose, mandible) to restore appearance and function; or cosmetic reasons may demand that hollows be filled in with fat, fascia, or cartilage. Occasionally refracturing is necessary to obtain the utmost in restoration of appearance and function.

Burns produce many plastic problems. Burn scars are notorious for their tendency to thicken. Contractures resulting from burns may require anything from a simple Z plastic to free grafting of skin.

Radio-dermatitis is another condition which calls on plastic surgery for solution. Prior to ulceration treatment is simple but once ulceration has occurred difficulties arise which make the condition a complicated one. Mixed infection obtains a firm hold in the affected tissues and thus free grafts are unlikely to succeed.

Infections of the face, both acute and chronic, and of both bone and soft tissue—since visible deformity may result—are included in plastic surgery. This applies not only to early care, but to the treatment of the late results.

The closure of cavities the result of osteo-myelitis not infrequently requires plastic procedure. Muscle and skin flaps may be swung into the cavity to obliterate the dead space.

Neoplastic disease, both benign and malignant, presents many problems requiring plastic surgery for relief. This is notably true in the face, but the condition in any superficial situation may require a plastic repair because of its presence, or because of the defects left after destructive treatment. Melanomata and dental cysts (e.g.-adamantinoma) are examples of benign neoplasms, rodent ulcer, and sarcoma of jaw, of malignant.

Finally there is the group of cases separated from the rest by the word cosmetic. Just how far one is justified in doing operations which are not concerned with the restoration of health is a debatable point. Effacing the wrinkles or lifting the breasts of an actress, where face and figure are literally part of her fortune, needs no great effort at justification. Changing the shape of a healthy nose in the ordinary individual is hardly justifiable—unless an unhealthy mental condition has developed which might be helped by an improved profile. Such a case must be differentiated from those in which the primary defect is mental. This is the real problem of the surgeon doing cosmetic surgery, and calls for careful consideration of each case asking for plastic repair aimed at improving appearance only.

The above outline, necessarily incomplete, presents a picture of the field of plastic surgery. The specialty differs from most general surgery in that results as a rule are not obtained in a week or a month, but in months and years. It calls for careful planning and endless patience, plus a philosophy which is secure against occasional setbacks, and the all too rare attainment of the original goal.

SOME FAMOUS MEDICAL SCHOOLS

THE BRITISH POST-GRADUATE MEDICAL SCHOOL.

By KENT HARRISON, M.D. (Tor.), F.R.C.S. (Lond.)
Leverhulme Scholar in Surgical Research.

The British Post Graduate Medical School, DuCane Rd., London W-12, was opened in May, 1935, by His late Majesty King George V. It has been developed by the combined activity of the London University and the London County Council, the former managing largely the treatment of patients and the teaching, the latter the organization and administration of the Hospital.

With the development of a School for Post Graduates only, with localization of teaching and clinical material, the efforts of the student have been facilitated in that there being no undergraduates he is able to have closer contact with the patients, and by centralisation he is saved the waste of time associated with traveling in various parts of London for his complement of teaching and cases.

The Director of the Department of Surgery is Professor G. Grey Turner, D.Ch., F.R.C.S., F.A.C.S., Vice President of the Royal College of Surgeons and formerly Professor of Surgery, University of Durham, Newcastle. These professional duties were combined with a very active practice. Modern Operative Surgery is edited by Professor Turner.

The Director of the Department of Medicine is Professor F. R. Fraser, M.A., M.D., F.R.C.P., formerly director of the Medical Professional Unit of St. Bartholomew's Hospital. Professor Fraser is now engaged, amongst many other activities, as a coeditor of the British Encyclopoedia of Medical Practice.

Professor James Young, D.S.O., M.D., F.R.C.S., F.C.O.G., is Director of obstetrics and gynaecology and is a coeditor of the Combined Textbook of Obstetrics and Gynaecology.

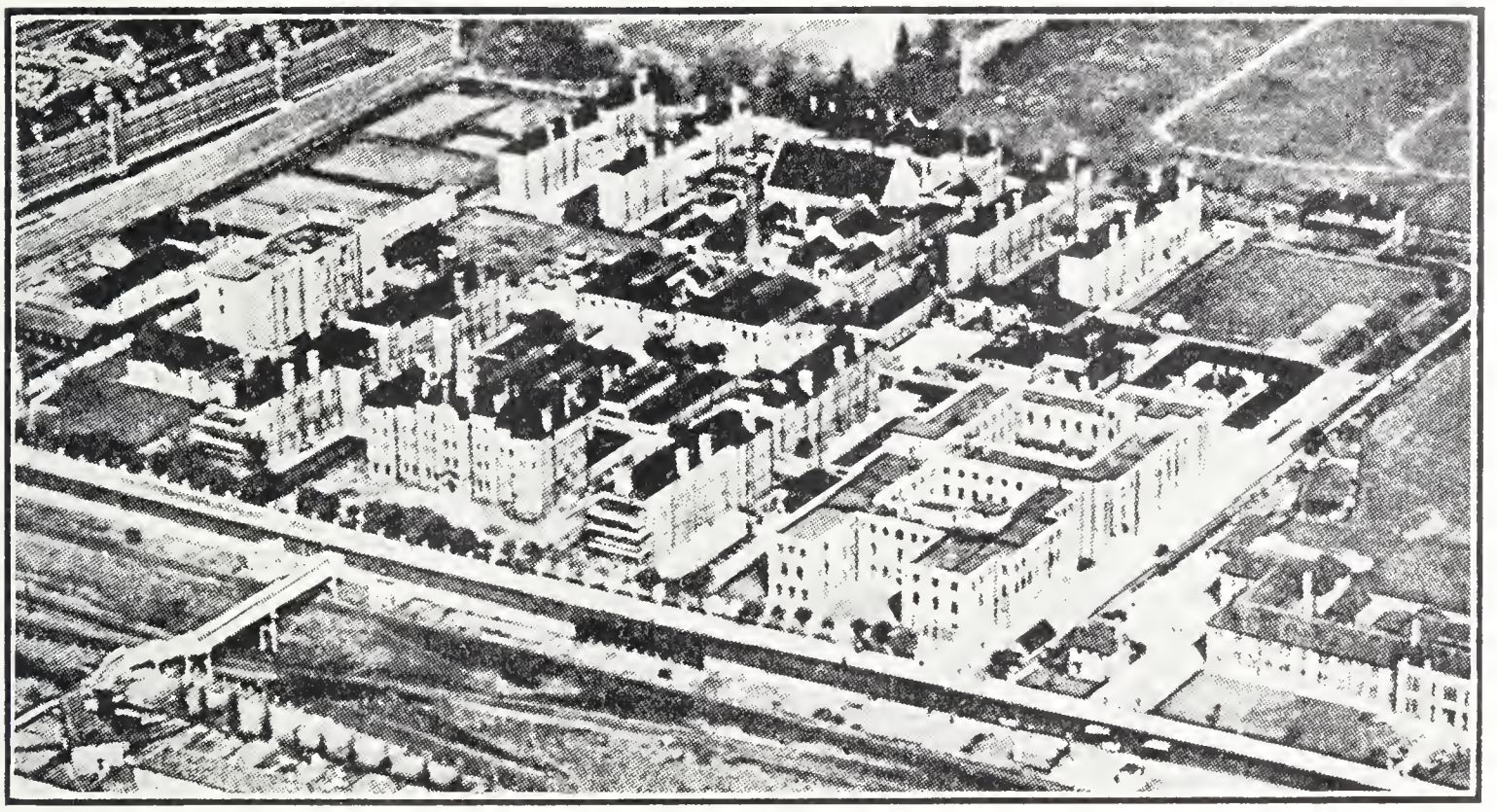
Professor J. Henry Dible, M.B., Ch.B., F.R.C.P., is Director of the Department of Pathology, and Dr. T. H. Bell, M.D. (Tor.) B.Sc. (med.), formerly of the Department of Pathology, University of Toronto, is the Senior Assistant in Morbid Anatomy

The First Assistants in all Departments are young men, able teachers and of wide clinical experience.

To write from the standpoint of an individual and yet keep to generalities is difficult and one's personal experiences are more valuable when discussed with the known needs of an individual in mind. However, the school may be considered from the points of view of a paying student or a payed member of the House Staff.

The student is offered intimate contact with the patients in the wards. He may examine them and take histories. The School does not provide courses with a view to preparing candidates for a higher degree, except in occasional cases.

A student with sufficient training to know what he wants to get from the cases will benefit most. He can study any type of case he wishes, which are



British Postgraduate Medical School and Hammersmith Hospital
—The Aerial Photographic Co., London.

all fully investigated and to the records of which he has full access. Teaching rounds are made regularly and particular aspects of the cases are discussed in detail. A student may be called upon to present a case in which he has taken particular interest.

Post mortems are usually obtained and are fully done, the specimens being demonstrated and histories correlated at a fixed time daily.

A student may become attached to the Haematological Department under Dr. Janet Vaughan when he will obtain practical experience of the highest order. A more intimate knowledge of Pathological Chemistry will be obtained by association with Dr. E. J. King, formerly of Toronto. Under Dr. Duncan White the student will procure first hand experience in reading X-Ray pictures, opaque meals and in X-Ray therapy for malignant disease.

Throughout the year lectures are given by specialists in aspects of medicine, surgery, obstetrics and gynaecology.

There is a very good reference library and a steadily enlarging Pathological Museum available.

The House appointments are for 6 months with remuneration of almost $44 per month including full maintenance. The medical posts are filled from the students attending the School, the surgical posts are advertised in the British Medical Journal.

The surgical, obstetrical and gynaecological posts are recognised by the College of Surgeons for preparation for the F.R.C.S. and M.C.O.G. diplomas.

The House Physician takes detailed histories and examinations and attends teaching rounds daily. Under any of the staff the cases include general medicine, but there is a definite assertion of the various divisions in medicine depending upon the interest of the man in charge of the Ward. These posts give an excellent training in medicine and for the M.R.C.P. diploma. A concentrated course at one of the other teaching hospitals following a House appointment at the School should prepare a man very well for the examination. The job is fairly arduous and there is little reading done, except on one's cases, even by those preparing for an examination. There is much teaching during the day, however. The House physician is treated as a confrere in the discussions on treatment.

The routine laboratory work is done by the Pathological Chemistry and Clinical Pathological Departments.

The surgical posts entail carefully made histories and examinations. All the posts except that of orthopoedic House surgeon cover general surgery and include genito-urinary work. The turn-over is not great and all cases are fully investigated, so that over 6 months one will have seen and had an opportunity of carefully considering examples of most of the surgery of election. The emergency surgery is not much in amount.

There is a good deal of thyroid surgery under Sir Thomas Dunhill and Mr. A. K. Henry, the House surgeon being responsible for correlating the medical and surgical treatment.

The House surgeon is first assistant at the operations. The amount done by himself, on the whole, is not great. Under favorable conditions, on one of the services at least, a House surgeon will do himself and obtain a careful thorough grounding in the simpler major operations. During the day and at the operations the principles of diagnosis and operating are much discussed.

To be closely associated with the Professor with his wealth of first hand knowledge, experience and dexterity, and his great understanding of human nature is a fine privilege.

The School is filling a definite want and filling it well. Improvement is continuous and the number of students attending steadily increases. For the man who has an idea of what he wants and is capable of helping himself to it the School offers great opportunities.

A brochure containing most useful information about courses, fees, number of beds, etc., and including some of the above statements may be obtained by writing to the Dean.

THE VITAMINS

III. THE VITAMIN B_2 COMPLEX

By WALLACE GRAHAM, M.D., D.D.S., M.R.C.P.

In the preceding issue of the Journal it was pointed out that the heat-stable factor of vitamin B was a complex substance made up of several factors, namely: riboflavin, vitamin B_6, a filtrate or chickpellagra factor, the P-P or pellagra-preventing factor and, possibly, more not yet fully identified.

Riboflavin.

(Sometimes called Vitamin B_2 or G)

Physiology and Chemistry.

In 1879 Blyth demonstrated a yellow pigment in milk which he called lactochrome. Several workers became interested in this pigment and more recently produced concentrated preparations of it from milk, liver, heart, yeast, etc. It was first isolated in crystalline form from milk and *lactoflavin* was suggested as a more appropriate name. It is now more commonly known as *riboflavin* in the United States. It is a yellow pigment with a characteristic green fluorescence and Kuhn and his co-workers first associated this pigment with vitamin B_2 when they observed that the activity of B_2 was related to the intensity of its yellow colour and green fluorescence. Later, in 1933, they were able to show that this pigment and the vitamin were identical substances. In 1935 Kuhn and Karrer almost simultaneously accomplished the synthesis of riboflavin and Paul György demonstrated that the biologic activity of the synthetic product was identical with that of the naturally occurring vitamin.

It appears that riboflavin has some physiological function in the oxidation process in cells. Warburg and Christian in 1932 isolated a new oxidation enzyme from aqueous extracts of yeast and the enzyme in solution was found to be yellow with a green fluorescence. These workers were able to split up the enzyme into a pigment component and a protein component, either of which alone had no enzyme activity. The pigment fraction of the enzyme was riboflavin and it has now been practically established that the vitamin activity of riboflavin is due to the fact that it forms an ester with phosphoric acid which combines with a protein to form the yellow oxidation enzyme. This enzyme is present in every living cell at least in the higher forms of life and as riboflavin cannot be synthesized by the animal cell it must be included in the diet so that the enzyme may be produced for the chemical reactions involved in cell respiration.

Storage and Excretion.

In animal tissues the liver and kidney contain the most riboflavin but Kuhn in 1935 reported that the flavin content of organs cannot be much increased even though the riboflavin content of the diet is increased ten times. The body stores are guarded carefully, however, and in rats that die of riboflavin deficiency there is still one-third of the normal amount found in the liver, kidney and heart. When the diet is adequate, riboflavin is excreted in both the urine and faeces of animals but none is found in the urine of rats after they have been on a riboflavin deficient diet for fourteen days. In humans taking an increased amount of riboflavin, the excretion corresponds with the intake but in deficient diets the excretion exceeds the intake, which is evidence that some storage exists.[1] The yellow colour of urine is not due to the presence of riboflavin.

Sources and Requirements.

Riboflavin has a wide distribution in the plant and animal kingdoms but is less abundant than B_1 in seeds which form a large part of our diet. It is probably formed in the green leaves of plants and remains there in highest concentration in contrast to carotene which is transferred from the leaf to the root in carrots.[2] Because of its wide consumption, milk is a relatively stable and dependable source of riboflavin and is probably the chief source in the dietaries of children. No serious loss occurs in milk during the processes of pasteurization, drying or condensing. Among the meats, liver, chicken and beef are good sources but liver is particularly potent, containing ten times as much as beef. Other good sources are egg yolk, spinach, wheat germ, yeast, peas and lima beans.

In man, no condition due to riboflavin avitaminosis has ever been demonstrated so that the amount required for normal human nutrition is as yet a matter of judgment rather than actual measurement. An assay of riboflavin in various foodstuffs was carried out by Bourquin and Sherman[3] using a rat growth method which measured riboflavin rather than any other factors, and the quantitative term now used is that of Bourquin-Sherman units. The most influential estimate of human requirements is probably that of Stiebeling[4] who states that children up to seven years of age require 450 units, from seven to ten years 540 units, and adults 600 Bourquin-Sherman units daily.

Pellagra.

A deficiency in factors of the B_2 complex other than riboflavin may give rise to a clinical syndrome known as pellagra. It is a chronic disease occurring chiefly among maize-eating peoples in Southern Europe, Egypt, India, China, Japan and in the southern districts of the United States of America. The syndrome is characterized by symptoms referred chiefly to the gastrointestinal, nervous and dermal systems, affecting particularly those areas of the skin which are exposed to the sun's rays.

Casal, as early as 1735, actually ascribed the condition to faulty nutrition and Funk, in 1912, supported its dietary origin. Goldberger and Tanner,[5] in 1924, finally limited the deficiency to a fraction of the heat-stable B_2 complex now known as the P-P or pellagra-preventing component which is present in large quantities in dried brewer's yeast. Spies and De Wolf, in 1933, found that in the northern states 90 per cent. of the cases of pellagra were associated with alcoholism, the substitution of alcohol for food favouring its production.

Premonitory symptoms of weakness, anorexia, giddiness and mental depression may recur for several years before the characteristic lesions develop. The alimentary symptoms are characterized by a stomatitis varying in intensity; the buccal mucosa and tongue may be intensely inflamed. Vomiting and diarrhoea are frequent findings and a megalocytic anaemia may be encountered in severe cases.

The skin lesions are chiefly limited to those areas directly exposed to the sun's rays: the back of the hands, forearms, face, neck, upper part of chest, etc. Commencing as an erythema the skin shows redness and swelling, sometimes with bleb formation. Pigmentation and thickening results, with later atrophy. The lesions are characterized by their absolute symmetry and sharply demarcated, pigmented borders.

An early mental depression is followed by the neurological features of multiple peripheral neuritis or may resemble subacute combined degeneration of the cord with spastic paraplegia, sensory disturbances, increased knee and ankle jerks and an extensor Babinski response. Later a flaccid paralysis may supervene. Mental disorders have necessitated detention in asylums.

Treatment.

It is probable that a deficiency in more than one dietary factor is involved in pellagra as some of the characteristic lesions, for example the dermal or nervous manifestations, may be absent in some cases. However, since the factors of the B complex are fortunately closely associated in many foodstuffs, the aetiological factor is of importance only if one is treating pellagra with purified vitamin fractions. Evidently a deficiency in riboflavin is not the cause of pellagra as it will not cure the condition,[6] and cases have been treated successfully with diets deficient in that vitamin.[7] The principal features of the dietary treatment as pointed out by Sebrell[8] are as follows: The diet should contain at least one quart of milk daily and in addition lean meats, liver, meat soups and broths. Other good pellagra-preventing foods are wheat germ, buttermilk, green peas and tomato juice. Three to four thousand calories should be taken daily by giving feedings at frequent intervals. Thirty grams or more of dried powdered yeast should be included daily. Liver extracts in large doses, orally or parenterally, are recommended in severe cases. Permanent control can be obtained only by bringing about permanent changes in dietary habits.

Nicotinic Acid in the Treatment of Pellagra.

Recently a new drug has been effectively introduced for the treatment of pellagra. During his early work on vitamins, Funk demonstrated that nicotinic acid was a constituent of the vitamin B complex. Later Elvehjem and his collaborators,[9] while searching for the antipellagra factor, isolated nicotinic acid from active concentrates and found that a commercial preparation was effective in curing black-tongue in dogs. During the present year Spies, Cooper and Blankenhorn have shown that it is also effective in curing many of the lesions of pellagra. Within seventy-two hours of the administration of nicotinic acid to cases of pellagra, Spies[10] observed a blanching of the erythema, a return to normal of gastrointestinal function and remission of ment-

al abnormalities. Within the first twenty-four hours the picture of apathy and listlessness changed to one of wide-awake interest. As well, these workers had shown that people suffering from pellagra had an abnormal porphyrin metabolism and were excreting abnormal amounts of coproporphyrin I and III in their urine. Following the administration of nicotinic acid decrease or cessation of the porphyrinuria occurred. Nicotinic acid will, therefore, cure the cutaneous and mucous membrane lesions, heal the glossitis, stomatitis, vaginitis, etc., but healing will not occur if the skin is broken, moist and ulcerated. It is also a specific therapeutic agent for the acute mental symptoms of pellagra.[11] It was found, however, that nicotinic acid was of no value for the associated peripheral neuritis but the nervous lesions responded in all cases to vitamin B_1 therapy. Thiamin chloride (vitamin B_1) in large doses of 50 milligrams twice a day resulted in rapid improvement.

The rôle of nicotinic acid in the nutrition of the body is not yet clear but it would appear that a deficiency in this substance leads to cellular changes in the skin, alimentary tract and other systems as well as initiating a change in porphyrin metabolism. The fact that nicotinic acid cures all lesions of the mucous membranes but has no effect on the nervous manifestations, suggests that the lesions of pellagra are caused by a lack of more than one essential substance. As Sebrell[8] states: it appears that nicotinic acid is either the P-P vitamin or a provitamin or that it is only one of two or more substances necessary for the prevention of all the symptoms described as pellagra.

Dosage.—In the treatment of pellagra nicotinic acid is given in doses of 50 to 100 milligrams five or six times daily. Despite the excellent results of this therapy Spies and his collaborators are convinced that all patients with pellagra should be given sufficient rest and adequate amounts of a well balanced diet as well.

The P-P or Pellagra-Preventing Factor.

The term pellagra-preventing or black-tongue-preventing factor is applied to the component of the B_2 complex originally postulated by Goldberger and Tanner[5] as necessary for the prevention of human pellagra. As stated above, nicotinic acid, if not actually the P-P factor, is at least closely related to it. There is no doubt that black-tongue in dogs and pellagra in humans are analagous so that the dog is an excellent experimental animal for further investigation and identification of this factor. The P-P factor is definitely distinct from riboflavin so that the assay of foods in Bourquin-Sherman units, as a measure of their riboflavin content, does not give a true measure of their pellagra-preventing qualities.

Vitamin B_6 (The Rat Antidermatitis Factor).

The exact status of vitamin B_6 has not yet been finally determined. There is evidence that vitamin B_6 is distinct from the P-P factor and it is now felt that what has been called rat pellagra in all probability bears no relation to human pellagra. Rats on diets deficient in this factor develop a symmetrical dermatosis affecting first the paws and tips of the ears and nose. This has been referred to as a pellagra-like condition but cases of human pellagra have been treated successfully with diets free of vitamin B_6. At the present time this factor has been found necessary only in the nutrition of the rat and whether one or more factors are responsible for the lesions produced is not yet apparent.

The Filtrate Factor.

If vitamin B_1 and riboflavin are first removed from the whole vitamin B complex, further fractionation can be accomplished by adsorption with fuller's earth. The fraction remaining after the adsorption is free from B_6 and has been called the filtrate factor or chick

pellagra factor. This factor has been found to be effective in the treatment of human pellagra, nutritional dermatosis in chicks and black-tongue in dogs. Therefore, at the present time there is not sufficient evidence to state that it is entirely distinct from the P-P factor mentioned above.[12]

An attempt has been made to clarify the rather confusing picture of the vitamin B complex and it is obvious that further investigation is necessary before these accessory food substances will be fully identified. In our particular district most of the vitamin fractions mentioned are of purely academic interest as we rarely see the lesions of beriberi or pellagra. Only two members of the B complex—vitamin B_1 and riboflavin—have been produced as chemical entities, and only two factors—vitamin B_1 and the P-P factor—have been definitely linked with deficiency diseases in man. However, the fact that no specific disease is related to many of the components does not mean that they are not valuable assets in the nutrition of man and a study of the foods containing them should help the physician in choosing a well-balanced diet for his patients.

REFERENCES.

1. Emmerie, A., Nature, **138,** 164, 1936.
2. Sherman, H. C., and Lanford, C.S., Jour. Amer. Med. Assn., **110,** 1278, 1938.
3. Bourquin, A., and Sherman, H. C., Jour. Amer. Chem. Soc., **53,** 3501, 1931.
4. Stiekeling, H. K., Publications of the U.S. Dept. of Agriculture, 1936. (Referred to by Sherman and Lanford[2]).
5. Goldberger, J., and Tanner, W. F., Public Health Reports, **39,** 87, 1924.
6. Dann, W. J., Jour. Nutrition, **11,** 451, 1936.
7. Fouts, P. J., Lepkovsky, S., Helmer, O. M., and Jukes, T. H., Proc. Soc. Exp. Biol. and Med., **35,** 245, 1936
8. Sebrell, W. H., Jour. Amer. Med. Assn., **110** 1665, 1938.
9. Elvehjem, C. A., Madden, R. J., Strong, F. M., and Woodley, D. W., Jour. Amer. Chem. Soc., **59,** 1767, 1937.
10. Spies, T. D., Bean, W. B., and Stone, R. E., Jour. Amer. Med. Assn., **111,** 584, 1938.
11. Spies, T. D., Aring, C. D., Gelperin, J., and Bean, W. B., Amer. Jour. Med. Sc., **196,** 461, 1938.
12. Nelson, E. M., Jour. Amer. Med. Assn., **110,** 645, 1938.

Some More Outstanding Books

Andrews—Diseases of the Skin, 2nd Ed.
Beck—Laboratory Manual of Hematologic Technic
Boyd—Surgical Pathology, 4th Ed.
Curtis—Textbook of Gynaecology, 3rd Ed.
Mallory—Pathological Technique
Norris & Landis—Diseases of the Chest and the Principles of Physical Diagnosis, 6th Ed.
Schumann—Textbook of Obstetrics
Scudder—The Treatment of Fractures, 11th Ed.

McAinsh & Co. Limited
Dealers in Good Books Since 1885

388 YONGE ST. TORONTO

THE ADRENAL CORTEX

By D. H. COPP, B.A., '39, and N. LITTNER, B.A., '40

The adrenal cortex affords a striking example of the close relationship between experimental physiology and clinical medicine in the study of endocrine function. While there is still some confusion regarding even normal function, recent work has done much to increase our understanding of two clinical conditions involving the gland: Addison's Disease and the Adreno-genital syndrome.

Anatomy.

The Adrenal in man really consists of two distinct glands—the Medulla derived from ectoderm as part of the Sympathetic Nervous System, and the Cortex, derived from mesoderm in close relationship to the sex glands. Indeed, in primitive fishes, the two parts exist as quite independent organs.

At birth, the adrenal is 1/3 the size of the kidney, this enormous development being chiefly due to a very large Foetal Cortex, over which the True Cortex grows. With rapid degeneration of the foetal portion, the adrenal shrinks to its adult proportion of about 1/30 the size of the kidney.

The adult adrenals are two small organs of a total average weight of 6-7 gms., lying like caps on the upper poles of the kidneys. They have a relatively enormous arterial blood supply, while their short, wide veins empty immediately into the main blood stream in the inferior vena cava. The splanchnic nerves control both the glands and their blood supply.

Physiology.

Little was known of the function of the adrenals, until the clinical work of Thomas Addison in 1855, and the experimental work that followed, established the importance of the adrenal cortex to life. Some of the earlier workers thought that it was an organ for detoxifying the blood, while others felt that its chief function was concerned with cholesterol metabolism.

However, the modern view is well established that the adrenal cortex is an endocrine organ elaborating an enzyme which is essential to life. Numerous theories have been advanced to explain the action of this hormone, which has been named "cortin."

(1) *Action of Cortin.*—The action of the hormone is best studied by following the changes which occur in an animal completely deprived of cortin. When the adrenal glands of an animal, such as a dog or cat, are both removed, the complete picture of adrenal insufficiency develops in a week or two.

The most significant change is a disturbance in salt and water metabolism. There is an increased excretion of sodium and chloride, along with water, resulting in a decrease in the concentration of these ions in the plasma. Simultaneously the serum Potassium rises.

Loss of water is most important, and produces dehydrations especially of the blood. Total blood volume decreases while the blood becomes concentrated as evidenced by increased red cell count and haematocrit readings. These are factors in producing the low blood pressure and sluggish circulation. If cortin is given, blood volume and concentration quickly return to normal, at the expense of tissue fluids, producing the more familiar picture of simple dehydration.

Disturbances of carbohydrate metabolism are manifested by a decrease in the glycogen of liver and muscle, and a low blood sugar. At the same time, the N.P.N. of the blood rises due to urea retention, and there is impairment of kidney function.

For a few days the animals may show no outward signs of metabolic

upset, but soon the appetite fails, and there is exhaustion of available stores of fluid with dehydration. Muscle weakness and apathy ensue, with sometimes vomiting and diarrhoea. The blood pressure falls progressively, the animal becomes comatose, body temperature falls, and the B.P. sinks to zero with death. Recovery is dramatic when cortical extract is given, especially if saline is added.

The various theories which have been advanced to account for these changes have each in turn stressed variations in one or other of the blood components as being the fundamental upset.

(a) Loeb and Harrop believe that cortin, by controlling kidney function, regulates the *sodium and water* content of the blood.

(b) Zwemer and others believe that the increase in blood *Potassium* is the fundamental change. They have been able to produce typical signs of adrenal insufficiency by giving large doses of Potassium.

(c) Swingle and Pfiffner suggest that cortin controls the equilibrium between *tissue and blood fluids,* as evidenced by the rapid improvement in the anhydraemia of adrenal insufficiency when cortical extract is given.

(d) Britton maintains that the chief if not the sole function of cortin is in relation to *carbohydrate metabolism.*

(e) Verzar and Jiminez-Diaz consider that cortin has an even more fundamental function connected with the phosphorylating mechanism in fat and carbohydrate metabolism. The changes in kidney tubules and function they feel are secondary to this.

Great improvements in cortin since the first active extract was prepared in 1927, have culminated in the isolation of a pure crystalline hormone, corticosterone, by Reichstein in 1937. He has since prepared synthetically from stigmasterol, a compound with similar activity — desoxycorticosterone — which appears to be a simple alcohol derivative of progesterone, the hormone of the corpus luteum. The formula also resembles that of cholesterol and the other sex hormones.

(2) *Relation to the Pituitary.*—Hypophysectomy is followed by rapid and extensive atrophy of the adrenal cortex. This atrophy may be prevented by pituitary implants, or by injecting extracts of the anterior lobe containing the so-called "Interrenotropic Hormone." This extract will also cause hypertrophy of the normal adrenal cortex. A relationship is also found in many clinical conditions involving both pituitary and adrenal cortex.

(3) *Relation to Sex Glands.*—A close relationship between the adrenal cortex and the gonads is suggested by the following facts:

(a) They are intimately connected developmentally.

(b) The formula of corticosterone closely resembles that of the sex hormones.

(c) Certain abnormal secondary sex changes are regularly associated with tumours of the adrenal cortex.

(4) *Relation to Vitamins.* — The adrenal cortex is extremely rich in Vitamin C, while in Scurvy there is hypertrophy of the gland. A similar hypertrophy occurs in deficiency of B_1 and B_2, while atrophy occurs with deficiency of Vitamin A. The exact significance of these changes is not yet clearly understood.

Adreno-Genital Syndrome

(1) *Clinical Features.* — This syndrome may be defined as that condition in which secondary male sex characteristics appear in the female or in children, associated with hyperplasia or tumour of the adrenal cortex. The condition is very uncommon. Its clinical manifestations vary with age.

When the adrenal change is congenital, there is often a pseudohermaphroditism, with internal organs of the female type, but external organs and changes approaching the male.

In children, there is precocious de-

velopment of the secondary male changes in both sexes, often as early as two years. Hair appears on the face, chest and pubis, and the voice may become deep.

The adult type occurs only in women, and is marked by a regression of the feminine characteristics, and development of the male ones. There is amenorrhea and atrophy of the breasts, while the body hair takes up a masculine distribution, with development of a beard and moustache. These are the familiar "bearded ladies" of the side shows. The voice alters and her outlook may become masculine. A high blood pressure and blood sugar contrasts with the low figures in Adrenal Insufficiency.

A few cases of similar adrenal tumours in adult males associated with feminization and large functioning breasts have been reported.

(2) *Pathology.*—In all these cases there is hyperplasia, adenoma or carcinoma of the adrenal cortex. However, not all tumours of the cortex produce these sex changes. According to Broster and Vines, the distinguishing feature in the adreno-genital syndrome is a fuchsinophil staining of the tumour cells.

This staining reaction is given by the foetal cortex, and by the androgenic zone in certain animals, but not by the true adult cortex. They claim that the syndrome is not due to hyperfunction of cortin, but is due to persistence and hyperfunction of the foetal and rogenic zone, which normally degenerates soon after birth. This view is supported by the failure to obtain any sex changes by injecting large doses of cortical extract.

(3) *Treatment.*—The treatment is surgical removal of the adrenal tumour, or in cases of hyperplasia with no tumour, removal of the Medulla and inner hyperplastic and regenic zone. It is wise to give cortical extract post-operatively for a week or two. Unless Addison's Disease develops due to removal of all the cortex, results are usually satisfactory—the abnormal hair drops out, and the feminine features tend to return.

Addison's Disease.

History.—In 1849, Thomas Addison, then at Guy's Hospital, became interested in lesions of the adrenals while searching for the cause of Pernicious Anaemia. Six years later he published his classical monograph: "On the Constitutional and Local Effects of Disease of the Suprarenal Capsules." His observations were so accurate that until recent years, almost nothing has been added to our knowledge of the disease which bears his name.

In the following description he sets forth many of its essential features:

"The disease develops in the third or fourth decade of life, usually quite insidiously, with adynamia and apathy. To these are added disturbances of the digestive tract (constipation, often alternating with diarrhoea), and pigmenting of the skin and mucous membranes: the patients succumb under a gradually increasing cachexia, not rarely with stormy terminal manifestations; autopsy almost always shows disease of both suprarenals, mostly tuberculous caseation."

Pathology.—From the point of frequency it is a relatively rare condition. In the United States it is estimated that only 300-400 die annually from this cause. Since 1925, there have only been ten cases diagnosed Addison's Disease among some 6,000 autopsies at the Toronto General Hospital. Of these, 7 were due to tuberculous destruction, 3 to simple atrophy of the adrenal cortex.

In all cases the primary lesion has been a bilateral destruction of the adrenal cortices. Fibro-caseous tuberculosis of the adrenals has been the cause in the great majority of cases, although with the decreasing incidence of this infection the proportion is becoming less, and Snell in 1930 reported 30 cases in which tuberculosis was re-

sponsible in only 43%, simple atrophy accounting for the remainder.

Aside from tuberculous lesions elsewhere in the body, other autopsy findings commonly associated with Addison's Disease are: general lymphoid hyperplasia suggestive of "status Lymphaticus"; cardiac atrophy; and diminished or absent basophiles in the anterior lobe of the pituitary.

Clinical Features.—As Addison observed, the disease tends to run a gradually progressive course, with periods of remission when symptoms improve, and interrupted by acute exacerbations or crises when the patient is gravely ill.

The most constant and early symptom is a general asthenia, with loss of muscle power and a feeling of fatigue. The appetite is commonly poor, and there is loss of weight.

Pigmentation also appears early, and may be the first thing noticed by the patient. It occurs as a brownish tan, frequently with jet black freckles, more pronounced on parts exposed to pressure or to light. There are similar patches on the mucous membranes. The pigmentation is due to a deposition of melanin in the deepest layer of the epidermis.

Digestive disturbances are common, and may take the form of constipation, diarrhoea, hiccoughs or vomiting.

On examination, the blood pressure is characteristically low, with a systolic pressure usually under 100. There may be slight changes in the blood chemistry, or none at all.

The patient, like the diabetic, is extremely susceptible to any adverse conditions, such as extremes of temperature, fatigue, drugs, infections, and even the most minor surgical procedures. These frequently precipitate a crisis of acute adrenal insufficiency, and indeed such a crisis is occasionally the first notification that a patient has Addison's Disease.

The crisis is characterized, as in animals, by apathy, marked muscle weakness, and often vomiting. There is occasionally severe abdominal pain, and this may lead to the erroneous diagnosis of "Acute Abdomen."

An examination of the blood may reveal a high Hb. and Red Cell count, indicative of blood dehydration, although the low grade anaemia common in chronic Addison's Disease may mask this. The serum Sodium is usually low, as is the blood sugar, while the N.P.N. may be elevated to 40-60 mg.% or higher. The blood pressure is low and continues to fall, while the patient is gravely ill and requires immediate treatment.

Diagnosis.—The diagnosis in a typical case is easy, but obscure ones may present great difficulties.

Asthenia and general weakness is common in many prolonged debilitating illnesses, as are hypotension and digestive disturbances. Pigmentation resembling that of Addison's Disease may occur in a variety of conditions, as: Haemochromatosis, certain cases of Pernicious Anaemia, Chronic Arsenic Poisoning, and even such common maladies as Sun Tan, Pregnancy, and Vagabond's Disease or "The Itch." The most difficult diagnosis is between certain cases of Simmond's Pituitary Cachexia, which may present the identical clinical picture, and in which there is often atrophy of the adrenal cortex along with that of the pituitary.

In doubtful cases, the Salt Deprivation Test of Cutler and Wilder is of great value. It depends on the negative salt balance in Adrenal Cortical Insufficiency, so that Sodium Chloride is lost in the urine even when the intake is very low.

On a diet low in sodium chloride, but high in Potassium, the chloride excretion in the urine is determined. This test should only be done with the greatest caution, and in hospital, because of the danger of precipitating an acute crisis—which may not only settle the diagnosis, but may settle the patient as well.

Treatment.—The principle of treatment is to correct the physiological

changes produced by adrenal insufficiency, and this is accomplished, as in diabetes, by dietary measures, and by replacement therapy with hormone.

Two types of problem present themselves—that of the patient with Chronic Addison's Disease, and that of the patient in Acute Crisis.

(a) *Chronic Addison's Disease.*—These may sometimes be carried along without cortin by dietary measures alone. The negative Sodium balance is corrected by administering up to 10 Gm. Sodium Chloride and half that amount of Sodium Citrate daily, either on the food, in capsules, or as a flavoured drink. In addition, following the work of Zwemer, a diet low in Potassium is given.

This regimen may be sufficient in mild cases, but if improvement is not satisfactory, it may be advisable to give cortical extract intramuscularly —say 5 c.c. every other day. The dose, as that of insulin, must be adjusted to suit each individual case. The average maintenance cost is about $100 per year.

The patient's life should be ordered in moderation to avoid all undue strain or fatigue. Drugs, especially barbiturates and thyroid, should not be used, as the patient is very sensitive to them. All infectious—even a simple head cold—must be considered seriously, and the dose of salt and extract increased.

Surgery of even a minor nature should only be attempted when absolutely necessary, and then only after the patient has been prepared by large doses of cortical extract.

(b) *Acute Crisis.*—Despite the greatest care, a patient may go into crisis —a condition which demands immediate treatment if a fatal outcome is to be avoided.

The patient should be put at complete rest in a quiet darkened room. The history may be known, or may be obtained from one of the family, but on no account should he be disturbed by exhaustive questioning or examining. The diagnosis should be made, and the blood pressure and extent of dehydration noted. Blood is drawn for determinations of blood sugar, chloride, and N.P.N., which will be of value in following the progress of treatment. Without withdrawing the needle, an intravenous is started, and up to 2,000 c.c. of 5% glucose in 3% saline given in the first 24 hours. The first 300-400 c.c. may be given rapidly to restore blood volume, but the remainder is given slowly. 30-50 c.c. of adrenal cortical extract or its equivalent is given at the same time, usually in the same intravenous. However, repeated intravenous administration of the extract appears to build up an immunity so that it loses its effectiveness. This does not occur with intramuscular injection, which for this reason may be preferable.

Improvement is almost as dramatic as in diabetic coma, and when the clinical condition warrants, he may be transferred to the simple treatment outlined above for Chronic Addison's Disease.

(c) *Cortical Extract.*—Cortical Extract is usually given intramuscularly or even subcutaneously, except in Acute Crisis, where the more rapid intravenous route is preferred. The extract is also reported to be active by mouth, but since the activity is said to be only 1/12 that on parenteral injection, the cost is prohibitive.

The recently synthesized Desoxycorticosterone has been found equally effective in adrenalectomized animals, and has been recently used in the treatment of clinical Addison's Disease. Two cases have been reported by Dr. Simpson in the Lancet, and a few cases have been treated at the Toronto General Hospital in which the new Desoxycorticosterone was used with results equal to those with Cortical Extract.

Prognosis.—The outlook, once Addison's Disease is diagnosed, is not too promising, even with treatment. Susceptibility to infection, the dangers of Crisis, and above all, the presence of

active tuberculosis in tuberculous cases all add to the hazards of life.

Guttmann, reviewing 566 cases prior to 1930 and modern treatment, found that those with atrophy lived on the average 3 years, those with tuberculosis of the adrenals only a year. Those in which pigmentation appeared early did much better than those with early asthenia.

Modern treatment has greatly improved the outlook for those with simple atrophy, although it is too early to say how much. It has done little to lengthen the life of those with tuberculosis. It does, however, help alleviate symptoms in all cases, and allows many to enjoy life who would otherwise be invalids.

Surgical Shock.—Recently attention has been drawn to the remarkable similarity between Acute Adrenal Insufficiency and Surgical Shock—especially that following severe superficial burns and high intestinal obstruction. In these conditions, autopsy often shows extensive necrosis of the adrenal cortex, and it has been suggested that the condition of shock is really due to a secondary adrenal insufficiency. Experimental work lends some support to this view, and Cortical Extract has been used clinically in the treatment of Shock, although it is too early to draw any definite conclusions as to its efficacy.

Conclusion.

The anatomy and physiology of the Adrenal Cortex have been discussed, and two clinical conditions have been considered in which dysfunction of the cortex appears to be the primary factor.

The Adreno-Genital Syndrome of masculinization in women and children is associated with tumour of the cortex and probably hyperfunction of the masculinizing and erogenic zone of the foetus.

Addison's Disease is a pure case of endocrine hypofunction, similar to diabetes both in course and treatment. It runs a progressive course with remissions and acute exacerbations or crises. In the chronic phase, general weakness and pigmentation are the chief symptoms; in the acute crisis extreme weakness and gastro-intestinal upsets. Treatment in chronic cases is a diet low in potassium with large doses of salt, and cortical hormone if needed. In crisis, large amounts of sodium chloride, glucose, and cortin must be given intravenously.

Cortical extract has also been suggested for the treatment of a myriad of conditions, ranging from tuberculosis, asthma, enteric fevers, and status lymphaticus, to the common cold, and just plain fatigue. As Loeb remarks:

"There is a widespread and indiscriminate administration of cortical extract in small doses to all who 'are weary and heavy laden,'—a type of therapy which while it may or may not be harmful, is neither specific nor critically applied."

REFERENCES.

A. Grollmann: The Adrenals.
Rolleston: The Endocrine Organs in Health and Disease.
R. L. Loeb: Glandular Physiology and Therapy.
Broster and Vines: The Adrenals.
Broster: The Adreno-genital Syndrome. Lancet, Ap. 24, 1934.
Cleghorn: Experimental and Clinical Studies on Addison's Disease. C.M. A.J. 37:48.
Rynearson: Treatment of Addison's Disease. J.A.M.A. Sept. 3, 1938.

DIVERTICULITIS

By B. LASKI, '39.

Introduction.

As an introduction to this paper I am going to use a specific case of diverticulitis which shows many of the typical findings and complications of the disease and demonstrates the serious nature of the condition.

The case is that of a 48-year-old male. The symptoms first began with a gradual onset of crampy steady pain low down in the left lower quadrant. The only other gastro-intestinal symptom was a week of diarrhoea four years previously. The cramps were not marked, rather a steady pain low down on the left side was predominant. The pain was severe enough for him to seek aid and he was admitted to the hospital three weeks after its onset. On x-ray examination he was found to be suffering from a very severe diverticulitis of the signoid colon. A mass had formed in the lower left quadrant and at operation the mass which was an abcess was drained. The wound continued to drain along with considerable faecal materal. With the wound still draining slightly, after a stay of about nine weeks, he was discharged. Up to this point we have a case of diverticulitis which apparently had perforated and formed a localized abscess. Some mild obstruction was present as evidenced by the crampy pain although there were no other signs such as constipation. There was also a faecal fistula present. The patient carried on for about six months with a slight discharge from his wound. Then he again noticed a soreness on his left side, low down with increased swelling and discharge. On examination he was found to have slight rigidity and rebound tenderness and a large mass the size of a grapefruit just above his old incision. This new mass was a recurrence of infection and apparently the case seems to have been a failure under this treatment. Due to the evident progression of the disease it was decided that a transverse colostomy was needed and this was done. It was definitely proven that the bowel communicated with his wound by means of x-ray and also by the fact that irrigating the distil limbs of the colostomy caused fluid to flow from the wound. He was discharged with the idea of, at some future date, resecting the affected part and anastomosing transvere colon with rectum. On examination about a year later the mass was found to have disappeared but the wound was still discharging. However, the patient had carried on very well and had gained fifteen pounds Up to this time the results were rather discouraging and it was decided to provide freer drainage. The abdomen was opened in the lower left quadrant and the fistula removed. He left the hospital ten days later with his wound healed and no discharge. The operation was apparently successful and seems to have cured what was feared to be a rather hopeless case. It is hoped that this colostomy can be repaired and normal bowel continuity once more established after a lengthy treatment which has taken about three years.

Pathology

To begin with the basic principles of the disease diverticulitis must always be preceded by diverticulosis. This condition may be present anywhere in the bowel. It consists of small out pouchings, usually about the size of a pea, of mucosa and submucosa through the muscular layer at a point of weakness. For the purpose of this paper the discussion will be confined mainly to those occurring in the left large bowel. However, in passing it may be noted that diverticulae of the duo-

denum are much commoner than previously believed and that they occur mainly in the second part of the duodenum where they occur along the inner and posterior aspect of the bowel which is the weakest part due to the entrance of the vessels along this line. They usually give no symptoms but if large may give pressure symptoms. The main reason for the rarity of inflammation in them is that the content of the small bowel is fluid.

In the large bowel they occur usually on the convexity of the bowel between the taeniae and usually in two rows. They usually grow into the appendicis epiploicae, a point of weakness, due to the presence of a small artery in the appendices epiploicae. They are most common in the sigmoid. The condition is rare before 35 and 40.

It is a much more common condition than previously thought and usually is symptomless. It occurs in approximately five per cent of patients having a routine colon x-ray examination. Diverticulosis itself gives no symptoms and only when there is inflammation or diverticulitis are there symptoms and this is in about 15% of the 5%. The etiology of the primary lesion is unknown. It is probably a mixture of weakness and increased pressure due to constipation, cathartics and increased gas formation especially in obese individuals. The weakness is probably due to loss of elasticity and tone because this is a disease of the physically degenerating period of life.

Classification

To classify the condition we should divide diverticulitis into acute and chronic phases. The acute may be divided into

(a) Involving a single diverticulum
(b) non-perforating and
(c) perforating.

The chronic may be divided as follows

(a) Non-perforating — in which there are peri sigmoid adhesions and obstruction
(b) Chronic slow perforation.
  (i) peri sisgmoid abscess
  (ii) Into mesentery
  (iii) Into adjacent viscera.

It must be remembered that the chronic stage is not necessarily preceded by the acute condition.

Acute Diverticulitis

The acute cases are often associated with a hard concretion in a diverticudum and gives symptoms similar to those of appendicitis although it is likely to be left-sided. It may go on to perforation and to a local abscess or even general peritonitis. Local abscess formation is the more usual result of perforation. Therefore, a patient might come with crampy abdominal pain possibly starting in the region of the umbilicus and then shifting to the left lower quadrant. On examination one would find local rigidity and tenderness along with rebound tenderness and hyperaesthesia on the left lower quadrant. If the process had gone on for several days a palpable mass might be present in this area or even generalized rigidity. The patient would probably have fever and leucocytois. There is usually some upset in rate of flow of stool, either diarrhoea or constipation being present. However, it is really not this easy and diagnosis is often very difficult. As an example of how bizarre the symptoms may be, there have been two cases diagnosed as perforated duodenal ulcer and acute cholecystitis, the signs and symptoms pointing to the right upper quadrant. More often it is diagnosed as acute appendicitis and in several cases at operation the sigmoid was found in the right iliac fossa. One of the most signifigant symptoms is pain in the lower abdomen, particularly in the left iliac fossa, radiating to the rectum and relieved to some degree by passage of stool or flatus.

If diagnosed as an acute inflammation but with no perforation the treatment is conservative. The patient is put to bed with heat to the abdomen, lots

of fluid and a low residue diet. Purges should not be given and evacuation should be obtained by mechanical means. Mineral oil and agar agar should be given in large quantities. Olive oil enemas are also said to be of value.

If there has been perforation and the lesion appears localized, which is the usual condition with perforation, the treatment is the same until an abscess forms and then this is drained.

If there has been perforation and the formation of a generalized peritonitis it should be treated as any other abdominal emergency. Correcting the biochemical upset by the administration of salt and fluids the emergency is dealt with by operation.

No attempt should be made to repair the lesion. The incision should be wide and a rubber drainage tube put down into the area. The wound should be walled off by gauze saturated in liquid parafin and B.I.P.P. The reason for not attempting to close the perforation is because of the infection and oedema present. If there is a severe obstruction present which, it is thought, demands interference, caecostomy should be done. The reasons for this are fourfold. First it is easily done; secondly, it relieves the obstruction; thirdly, it is away from the site of the trouble which is of value especially if there is to be a resection at a later date and fourthly it is easily repaired. If this procedure is followed, it must be remembered, to sew the edges of the caecum to the skin margin so that the edges do not retract.

Chronic Diverticulitis

The chronic condition is more common and it is accompained by a peridverticulitis. Toxins leak through the mucosa and set up an extramucosal inflammation and a large amount of chronic inflammatory tissue is formed outside of the bowel. This changes to fibrous tissue and eventually may give stenosis and incidentally give a lesion very difficult to differentiate from Carcinoma even with the abdomen open. The mucosa rarely ulcerates while this is a common feature of carcinoma. This difficulty of differentiation is one of the very real dangers of chronic diverticulitis.

Diagnosis is aided by remembering the following points. The disease is rare before the age of forty. It occurs more often in men and usually in an obese person. There has probably been recurring, vague distress in the lower abdomen, sometimes radiating to the rectum, and relieved temporarily by passage of flatus or stool. There is constipation, which is probably increasing, in over 60% of cases. Bleeding is rare and diarrhoea and tenesmus may be present. Tenesmus is not as common as was believed formerly. In all there are usually some attacks of acute abdominal pain with rigidity, tenderness, fever and leucocytosis. On examination a mass may be felt. If this is not present there is little to go on outside of the tenderness which may be on either side below the umbilicus, because of the mobility of the sigmoid. On rectal examination a mass may be felt in the pouch of Douglas.

The x-ray is very useful in diagnosis. In a series of 44 cases at this hospital it was absolutely correct in 57% of cases which is indeed a high figure. One of the most helpful aids to diagnosis is the post evacuation air injection procedure. This plate to contrast with the previously taken Barium plate is of great help.

With the x-ray the lesion can be definitely localized and various appearances may present themselves. There may be a long tubular stricture present and little out pouchings may be visible especially in the post evacuation plate. If the condition is an old one the stricture may be shorter due to contraction *and very difficult to differentiate from Carcinoma.* Some cases of diverticulitis even with perforation have shown a normal looking colon. In a series of cases in this hospital over a five year period there were four cases diagnosed

as Carcinoma which later proved to be diverticulitis and three cases of carcinoma diagnosed as diverticulitis. Thus the x-ray cannot be relied upon completely. From these statements it may be gathered that the differentiation is a difficult problem. Even with the lesion visible this is so. Three cases of carcinoma have had their abdomens closed with the belief that it was diverticulitis. Some of the features that may help in diagnosis are haemorrhage in carcinoma, tenderness in diverticulitis and possibly a longer history and x-ray may clinch or aid tremendously in diagnosis, although one must remember that the presence of one does not exclude the possibility of the other.

The treatment of the condition in the absence of obstruction is mainly medical although in some of the more severe cases a caecostomy is of value. If there is obstruction this is a necessary procedure. The medical treatment again consists of bed rest with heat to the abdomen, a bland low residue diet and considerable amounts of paraffin by mouth and olive oil per rectum.

The danger of chronic diverticulitis is in its complications and the treatment in the main is to prevent these.

The chief complication is perforation of one of the diverticula thereby starting a local or generalized reaction. The local reaction of the tissues in forming a fibrous mass may result eventually in obstruction. Fistula with the bladder or some other organ are also caused by perforation. The main diagnostic feature of a fistula with the bladder is pneumaturia. If a mass has formed it may subside on medical treatment but it is more likely to require drainage and then the possibility of some such complicaton as an external fistula as in the case discussed must be kept in mind.

Discussion

These complications raise in one's mind the question of proper treatment of a simple non-complicated diverticulitis of sigmoid. The impression gained from the study of the late cases at this hospital is that if the diagnosis had been made early enough and the treatment of bed rest and dietary control instituted for at least a month followed by a supervised diet and periodic check-up, there would be less need for surgical interference at a later date.

Then there are the late cases. Would it not be better to resect the affected part earlier rather than wait and cause a lengthy illness which resists medical treatment? There are two important factors here. First it may be carcinoma and secondly the inflammation may have progressed so far that a resulting normal bowel is impossible. In both these conditions an early resection is desirable. In the free sigmoid loop the Mickulicz operation is ideal and lower down the end to end anastomosis is of more value due to mechanical factors. There has never been a recurrence of the disease after a successful resection despite the presence of diverticulae in the bowel proximal to the area removed.

In closing I would again like to remind you of the similarity of chronic diverticulitis and carcinoma and I will quote Dr. Graham in saying that "one should never condemn a patient as suffering from a hopelessly inoperable carcinoma of the left large bowel without first excluding diverticulitis."

THE CEREBRO-SPINAL FLUID MIRROR

By JAMES G. WATT, 4T0.

Many pathological conditions in the body are reflected by changes in the physical and chemical properties, and the cytology of the blood. Likewise diseases of the central nervous system are mirrored in the altered cerebro-spinal fluid. This fluid is obtained by lumbar puncture, and in studying it we observe its physical properties, and subject it to a chemical, serologic, and microscopic examination. This article reviews briefly the anatomy and physiology of cerebro-spinal fluid, describes the methods of obtaining it, the routine clinical tests used in examining it, and the characteristic changes in it in some common diseases of the central nervous system.

Anatomical Considerations.

The pathway of the cerebro-spinal fluid consist of two parts, ventricular and meningeal. All of the cerebral ventricles form part of the first pathway since they include within them the choroid plexus, and since they communicate with one another. The ventricles are lined by low columnar or cuboidal ependymal cells. Over the vascular tufts of the choroid plexus the cells become differentiated into a high columnar type. The second part is within the meninges. There are three of these membranes. The outermost is the dura mater, the cranial portion of which has two layers, and these lamina split to enclose the great venous sinuses. In the spinal region the two layers are not in approximation, the inner becomes the true spinal dura, and the outer forms the internal periosteum of the vertebral canal. Between them is the epidural space filled with fatty areolar tissue and thin-walled veins. The middle of the three meninges, the arachnoid, is a delicate fibrous matrix supporting a membrane of mesothelial cells. The dura and arachnoid are definite membranes separated by the fluid —containing epidural space. However, in certain places the two are fused to form the arachnoid villi, which extend into the walls of the venous sinuses, so that arachnoid mesothelium lies directly beneath vascular endothelium. Similar structures project into segmental veins in the spinal region. The pia mater is the innermost membrane and it dips down into all the convolutions of the brain. It is not continuous, but is pierced by the perivascular cuffs of the blood vessels.

The cerebro-spinal fluid circulates in the subarachnoid space, which is widened into lakes or cisterns at several points. They are the cisterna magna below the cerebellum and above the medulla, the cisterna pontis on the ventral aspect of the pons, and the cisterna basalis containing the circle of Willis. The spinal cord ends at the level of the upper border of the second lumbar vertebra, but the dura mater and the arachnoid continue to the lower border of the second sacral vertebra. Therefore we can make a puncture in the lower lumbar region to obtain cerebro-spinal fluid without risking injury to the spinal cord.

Physiology.

The cerebro-spinal fluid is formed by the epithelial cells of the choroid plexuses in the lateral and third ventricles, and possibly by the ependymal cells lining the ventricles. Flexner has proved that thirteen times as much caloric energy is required for the formation of a litre of fluid than is supplied by the difference in hydrostatic pressure between the choroidal capillaries and the cerebro-spinal fluid, so the cells of the choroid plexus must do work during the process of formation, and cerebro-spinal fluid is a true secretion.

The fluid formed in the lateral ventricles passes through the foramen of Munro to join that produced in the third ventricle. It continues through the aqueduct of Sylvius to the fourth ventricle, and then passes through the foramen of Magendie and the foramina of Luschka to the subarachnoid space. (It is interesting to note that in human embryos up to 50 mm. the inferior velum of the roof of the fourth ventricle is an intact membrane containing no foramina, yet is permeable to proteins and salts, so at this stage foramina are not essential). From the cisterna magna the cerebro-spinal fluid seeps slowly down the spinal canal within the arachnoid membrane. There is some loss due to absorption and some gain due to secretion of the cells lining the channel. The fluid also passes about the base of the brain and over the cerebral hemispheres and the whole central nervous system. These channels are clothed by a special cell, fluid retaining, so that a true circulation is maintained.

The cerebro-spinal fluid is absorbed into the venous sinuses from the arachnoid villi. There is a slow accessory mechanism of absorption into the lymphatic system of the body. The colloid osmotic pressure of the blood is higher than that of the cerebro-spinal fluid, and the hydrostatic pressure of the spinal fluid is greater than the intracranial venous pressure. These are the two factors responsible for the absorption.

The average volume of cerebro-spinal fluid in man is 135 cc. It is totally replaced about every six hours so approximately 550 cc. are formed each day. The normal pressure is 50-200 mm. of water with an average of 135 mm. in the horizontal position. The pressure in the lumbar region increases by about 200 mm. when one assumes the sitting position, while the pressure in the cisterna magna becomes subatmospheric.

The cerebro--spinal fluid is richer in chlorides than blood plasma, but the latter contains more protein, glucose, and a number of other ingredients (uric acid, urea, amino acids, calcium, sulphates, cholesterol, and inorganic phosphate). It is the higher chloride content of the cerebro-spinal fluid that gives it the same osmotic pressure as blood plasma.

	Blood Plasma	**Cerebro-Spinal Fluid**
	mgm. per 100 cc.	mgm. per 100 cc.
protein . .	6300-8500	16-38
sugar . . .	70-120	45-80
chloride . .	560-630	720-750

Methods of Obtaining Cerebro-Spinal Fluid.

(1) *Lumbar Puncture.*—This is done for the purpose of obtaining cerebro-spinal fluid, for administering lipiodol or local anaesthetic. The patient should lie on his side with his back arched as much as possible, and trying to approximate his head and knees. This separates the lumbar spines. Paint the lumbar sacral region with tincture of iodine and draw at the same time a line between the iliac crests. This crosses the third and fourth lumbar spines. Feel for the processus spinosi on this line and in the interval between the two inject a little 4% novocaine under the skin to raise a bleb. Then thrust the needle in towards the intervertebral space, injecting the solution as one does so. A platinum-iridium or nickle needle containing a bevelled edge and a stylet is then pushed through the anaesthetized area in a direction forwards, upwards and inwards with the bevel pointing to the side on which the patient is lying. The needle must be pushed in 5 or 6 cm. and a slight resistance is felt when the dura mater is pierced. When the stylet is removed fluid normally trickles out at one drop per second. If blood appears in the first few c.c. of fluid, but disappears later, it is due to injury to a vessel by the needle, and the blood-

stained portion should be separated from the rest.

If manometric readings are desired, the sterile manometer must be connected before any fluid escapes. Measuring the pressure under the influence of jugular compression is of the greatest diagnostic importance. Normally light pressure on both jugular veins causes an immediate rise in intrathecal pressure. (Queckenstedt sign). The mechanism is this; pressure on jugular veins →intracranial venous hyperaemia → increased intracranial pressure → increased cb.-fl. pressure. If the rise does not occur or is sluggish it is suggestive of subarachnoid block (spinal tumour). In complete sinus thrombosis the lumbar cb.-fl. pressure is unaffected by jugular compression on the side of the affected sinus, but jugular compression on the other side causes an excessive rise.

(2) *Cisternal Puncture*— is valuable for obtaining fluid from above a spinal block to compare with that below, for the administration of antisera, descending lipiodol, or air for ventriculograms. The needle is entered above the spine of the axis. There is always the danger of damaging the medulla oblongata, so this type of puncture is not used routinely.

(3) *Ventricular Puncture.*—In the child fluid can easily be withdrawn by passing a needle slightly downwards and outwards at the lateral angle of the anterior fontanelle. In the adult it is necessary to trephine a disc of the skull, so the method is not used except in special circumstances.

Puncture is contraindicated in severe infections or after vaccination for fear that the infection will have a greater chance of establishing itself in the central nervous system.

Examination of Cerebro-Spinal Fluid

(1) *Physical Characters.* — Normal cerebro-spinal fluid is colourless, clear, and does not coagulate on standing. Its specific gravity is 1006. Any yellowness is pathological and indicates either excess of protein or old haemorrhage. In Froin's syndrome a pronounced yellow colour (Xanthochromia), excess protein, and massive coagulation occurs, thus resembling blood plasma. This is seen in complete obstruction of the spinal canal due to tumour or pachymeningitis. Xanthocromia also occurs if blood has been present for 4-6 hours. Clots form in meningitis and polyneuritis also, and in tuberculous meningitis and sometimes anterior poliomyelitis the clot resembles a cobweb. (For the diagnosis of meningitis one may give the patient 2 grammes of uranin, i.e., sod. fluorescin, by mouth three hours before lumbar puncture. Only in cases of meningitis is the substance found in the cerebrospinal fluid. It causes the fluid to appear fluorescent).

Turbidity is due to pus, red blood cells, or bacteria. If the spinal fluid does not clear on standing the turbidity is due to micro-organisms. Blood caused by injury to a vessel by the needle is red and streaky, but blood due to subarachnoid haemorrhage is uniformly mixed with the fluid, and after standing the supernatent fluid is yellow.

Normal pressure is 50-200 mm. of water. A rise in pressure as high as 600 mm. may occur in cerebral compression (due to brain abscess tumour, oedema, middle meningeal haemorrhage), in tabes and acute G.P.I. Infections such as meningitis and ant. poliomyelitis cause a marked rise due to increased excretion. Chronic lead poisoning in children, leading to lead encephalitis, may cause the pressure to mount to 700 mm. A very low pressure or a rapid fall to zero indicates spinal block.

(2) *Microscopic Examination.* — If the cerebro-spinal fluid is turbid, 5 c.c. should be centrifugalized, films made from the deposit and stained with Leishman's and Gram's stains. Examine the films for the character of the cells and the presence of bacteria.

Cell Count.—The diluting fluid con-

sists of 10% acetic acid containing a little methyl blue. One part of this is mixed with nine parts of cerebro-spinal fluid in a pipette. A drop is placed in a Neubauer or Thoma-Zeiss counting chamber. Count all the cells in 9 sq. mm. of the chamber, using the low power objective.

Suppose X cells were counted.
then 0.9 cu. mm. contain X cells
(depth of the chamber is 1/10 mm.)
9.0 cu. mm. contain 10X cells.
and 9.0 cu. mm. of cb.-fl. contain 10/9 x 10X cells.
1.0 cu. mm. of cb.-fl. contains 100X/81 cells.

or the number of cells counted multiplied by 100/81 cells per cu. mm. Normally the number of cells is 3 per cu. mm. If the excess above this contains more than 75% polymorphonuclear leucocytes it is called the polymorphonuclear type, and if over 90% are mononuclears it is called the lymphocyte type. In meningococcus meningitis the polymorphs may be up to 1000 per cu. mm. or more, and in benign lymphocytic meningitis the mononuclears may reach 600 per cu. mm.

(3) *Routine Chemical Tests.*—(*a*) *Total proteid test.*—The total amount of proteids is estimated by finding out how much the cerebro-spinal fluid has to be diluted before the test becomes negative. The cerebro-spinal fluid is diluted in varying proportions with 0.9 per cent. saline solution. Each of these is slowly poured on to the surface of cencentrated nitric acid. The proteids are precipitated on the border between the two fluids. The time limit is three minutes and normally the test becomes negative at a dilution of 1 to 15 or less.

(b) *Globulin test.* — Globulins are precipitated by a semi-saturated solution of ammonium sulphate. This can be carried out as a ring test. Cerebro-spinal fluid diluted in varying proportions with water is poured on to the surface of a saturated ammonium sulphate solution. The time limit for the ring to appear is three minutes. The globulin reaction normally disappears at a dilution of 1 to 12.

Increase in the amount of proteids is found in inflammation of the meninges, tabes and general paralysis of the insane. In G.P.I. the globulin is increased out of all proportion to the total amount of proteids. When an increase of proteids occur without a corresponding increase in cells it suggests spinal tumour. Cerebral tumours and polyneuritis may cause a moderate rise in proteids without an increase of cells.

(c) *Pandy's test.*—This is a very sensitive globulin test. 1 part carbolic acid (crystal) is dissolved in 15 parts of distilled water, and one drop of cerebro-spinal fluid is let drop into 2 c.c. of this solution. A bluish-white clouding constitutes a positive reaction.

(d) *Blood test.*—A modification of the guaiac test is used. To ½ c.c of an emulsion of equal parts of old turpentine and tincture of guaiacum, 1 c.c. of cerebro-spinal fluid is added, and then four or five drops of acetic acid (25%). If a blue colour appears in 15 seconds the reaction is positive.

(c) *Test for glucose.*—The qualitative test can be carried out with Fehling's solution. 1 c.c. of cerebro-spinal fluid is boiled with 0.25 c.c. of Fehling's soln., and normally the latter should be almost decolourized. If much blue is left, the sugar content is reduced. The normal amount of glucose is 45-80 mgm. per 100 c.c. This is lost or diminished in acute meningitis, tabes, general paralysis, and is increased in encephalitis lethargica. The quantitative test is the same as that for blood. It is important for the differential diagnosis between epidemic encephalitis, where the glucose is increased, and the different forms of meningitis, where the glucose is usually greatly diminished.

(f) *Chloride test.*—This is a quantitative test. 2 c.c. of cb.-fl. are mixed with 10 c.c. of water, a few drops of pot. chromate are added as an indicator, and a little pure calcium carbonate to

ensure alkalinity. This is titrated with a silver nitrate solution (5.814 gm. $AgNO_3$ per litre) until the colour becomes orange. Each c.c. of silver nitrate corresponds to .01 percent of chlorides. A raised percentage of chlorides indicates renal inadequacy. The normal is 0.70 to 0.77 per cent. A percentage of 0.68 to 0.70 occurs in acute general infections or mild meningitis. Figures below 0.68 percent occur in grave meningitis, and a figure below 0.60 percent is seen in tuberculous meningitis only.

(g) *Wassermann reaction.*—The technique for this will not be described here. It should be carried out both in the blood and cerebro-spinal fluid in every case of suspected syphilis.

(h) *Lange's colloidal gold reaction.*—When the cerebro-spinal fluid has a high globulin content it develops the power to precipitate the particles of the colloidal gold suspension to which it is added. A constant quantity of colloidal gold is added to graded dilutions of cerebro-spinal fluid (1 in 10 to 1 in 10,000). There are 10 dilutions. The gold is precipitated in the first six dilutions in G.P.I., in the third and fourth dilutions precipitation is maximal in tabes, while in meningitic fluids precipitation is greatest in the sixth and eighth dilutions. Thus paretic, luetic, and meningitic curves may be plotted.

In disseminated sclerosis the combination of a negative Wassermann reaction with a paretic curve is found in the cerebro-spinal fluid.

Alterations in the Cerebro-Spinal Fluid in Certain Diseases of the Central Nervous System

Abscess of the Brain.—The cerebro-spinal fluid may be normal except for a rise in pressure, but more often there is a moderate increase in cells and protein. 30 cells per cu. mm. may be found and they are mostly lymphocytes. If meningitis develops there is a marked rise in the cell count.

Meningitis.—(1) *Meningococcal Meningitis.*—The pressure is raised due to the increased secretion of the fluid. The cerebro-spinal fluid is at first clear, but later becomes turbid. The protein content is very high, 30-80 mgm. per 100 c.c. Sugar is diminished or absent, due to the fermentative action of the meningococcus. There is a marked increase in cells most of which are polymorphonuclears. During recovery their place is gradually taken by macrophages, and finally by lymphocytes. The Gram-negative diplococci may not be seen since they are autolytic. A purulent fluid in which no organisms can be found is almost certainly meningococcal.

Antimeningococcal serum is administered intrathecally by cisternal puncture, because there is no true circulation of cerebro-spinal fluid and the serum merely spreads by diffusion. When treating a case by repeated intrathecal injection of antiserum, it sometimes happens that the meningococci disappear, but the fluid remains turbid and full of pus cells. This is due to an aseptic meningitis caused by the irritation of the serum.

Most cases of hydrocephalus, if we include patients of all ages, are due to meningitis. An exudate containing fibrin forms over the foramina in the roof of the fourth ventricle, or blocks the basal cisterns. This interferes with the return of the cerebro-spinal fluid to the venous system, absorption is impaired, and the fluid accumulates within the ventricles and dilates them.

(2) *Streptococcal Meningitis.*—It is usually secondary to middle ear infection. The changes in the cerebro-spinal fluid are the same as in meningococcal meningitis. The fluid may contain large numbers of Streptococci. Sulphanilamide is a great aid to recovery in these cases.

(3) *Pneumococcal Meningitis.*—This may be primary, or secondary to infection in the middle ear, nasal sinuses, or lung. The cerebro-spinal fluid is very purulent, and contains large numbers of

Pneumococci. The fibrinogen is greatly increased and the fluid may clot spontaneously.

(4) *Other Forms of Meningitis.*—Staphylococci, typhoid and para-typhoid bacilli, Bacillus coli, Bacillus influenzae, and Friedlander's bacillus are sometimes the cause of meningitis. The organisms are present in the cerebro-spinal fluid.

(5) *Meningitis Sympathica.*—This is a non-bacterial inflammatory reaction in the cerebro-spinal fluid. There is an increase in the amount of fluid and protein, and a marked increase in polymorphonuclear leucocytes, and turbidity of the fluid, but no bacteria are present.

(6) *Tuberculous Meningitis.*—This is a common condition. The diagnosis is made by lumbar punctures. The clinical picture and spinal fluid findings in anterior poliomyelitis, epidemic encephalitis, and a deep brain abscess are quite similar. The pressure is raised, the fluid is clear or opalescent, and almost never turbid. When allowed to stand a fine pellicle of fibrin forms which is laden with tubercle bacilli. This is very characteristic of tuberculous meningitis, is never seen in encephalitis and brain abcess, but a web sometimes forms in poliomyelitis and syphilitic meningitis. The protein is increased to a greater degree in tuberculous meningitis than in the other three (0.1 to 0.3 per cent). The sugar is decreased or absent. The chlorides are lower than in any other condition (below 0.65 per cent). The cell count is from 50 to 200 cells per cu. mm., mostly lymphocytes, but in children with very acute reactions there may be many polymorphonuclear leucocytes.

(7) *Benign Lymphocytic Meningitis.*—These are cases of acute but mild meningitis, with marked lymphocytosis. The cell count is about 600 per cu. mm. The fluid is sterile, with slight increase in protein but normal sugar and chlorides. The Wassermann reaction is negative but the colloidal gold test gives a meningitic or paretic curve. The etiology is unknown.

Encephalitis.—The cerebro--spinal fluid may be normal, but often shows a lymphocytosis with 50 to 100 cells per cu. mm. Globulin may be slightly increased. Glucose is high normal or slightly raised due to the tendency to hyperglycemia. The colloidal gold test may give a luetic curve. The condition must be differentiated from tuberculous meningitis and anterior poliomyelitis.

Acute Anterior Poliomyelitis.—The examination of the cerebro-spinal fluid is of great importance during the preparalytic stage of the disease. At first polymorphonuclear cells predominate, and number 30 to 200 per cu. mm. The globulin is low, but the fluid is opalescent and a fine web may form. As the disease progresses the lymphocytes replace the polymorphs, the cell count becomes less, and globulin rises. The sugar and chlorides are unchanged.

Neurosyphilis.—(1) *Primary and Secondary Stages.*—During the first stage of meningeal reactions is present in 20% of cases. There is an increase in lymphocytes in the cerebro-spinal fluid. As the second stage advances the lymphocytes increase in number up to 100 or so per cu. mm. Protein does not appear in excess until the second stage. A positive Wassermann occurs in only 10 to 15 per cent of cases. After passing the acute secondary stage, the lymphocytosis disappears, but a recurrent and very brisk reaction may develop and 1000 cells per cu. mm. may be found. They are lymphocytes, polymorphonuclears, and plasma cells. There is a high protein content and a strongly positive Wassermann reaction. During the latent period from the second to third year after infection about 20 per cent of cases have a lymphocytosis, protein excess, and a positive Wassermann reaction in the cerebro-spinal fluid. In the tertiary stage the cerebro-spinal fluid will be normal unless there is syphilitic meningitis.

(2) *Acute Syphilitic Meningitis.*—The fluid contains up to 500 lymphocytes per cu. mm., about 100 mgm. protein per 100 c.c., and very strong Was-

sermann reactions in both blood and cerebro-spinal fluid occur. The colloidal gold curve is of the paretic type.

A gumma or chronic syphilitic meningitis cause the same changes, but they are of lesser intensity than in the acute process.

(3) *Tabes Dorsalis.*—There is a lymphocytosis of from 10 to 80 cells per cu.mm. The protein of the cerebro-spinal fluid is slightly increased. The colloidal gold curve is of the luetic type. There may be a positive Wassermann reaction in the spinal fluid or the blood, or both. The Wassermann reaction is negative in 25 per cent of cases, however. A positve spinal fluid Wassermann is rarely influenced by antisyphilitic treatment, but the cell count is reduced. If meningeal irritation occurs, the cell count may increase greatly, and many poly-morphonuclears are seen.

(4) *General Paralysis of the Insane.*—The pressure of the cerebro-spinal fluid is raised. The cell count ranges from 30 to 200 per cu. mm. and consists of lymphocytes, plasma cells, macrophages, and polymorphonuclears. The protein is increased. The Wassermann reaction is nearly always positive in the spinal fluid and the blood. The colloidal gold reaction gives a paretic curve. Apart from the cell count, these abnormalities are often irresponsive to treatment.

Disseminated Sclerosis.—There is a mild lymphocytosis in the early stages and a slight increase of protein, but these changes disappear in the advanced sclerotic stage. The Wassermann reaction is always negative, but there is a paretic type of gold curve in about half the cases.

Intracranial Tumour.—On lumbar puncture the fluid may be found to be under great pressure (300 to 1000 mm. water), but normal otherwise. In some cases the tumour comes in contact with the fluid, either in the ventricles or at the base of the brain, and in these circumstances a protein increase may be found. Distortion of the lateral ventricle by the tumour is a common occurrence, and it can be detected by ventriculography.

Spinal Tumour.—The spinal fluid shows the "compression syndrome" e.g. massive spontaneous coagulation, xanthochromia, marked increase in protein, no corresponding increase in cells, if the canal is blocked. Sometimes these changes occur above the site of the block. The presence of block can be best shown by the Queckenstedt sign.

Subarachnoid Haemorrhage.—Lumbar puncture is a diagnostic procedure of importance in cases of suspected subarachnoid haemorrhage. In all cases there is abundant blood in the cerebrospinal fluid. When the fluid is allowed to stand the red blood corpuscles settle, leaving a yellow supernatant fluid. The usual source of haemorrhage is from an aneurism of the circle of Willis or of one of the adjacent cerebral arteries. It is interesting to note that a subdural haematoma caused by injury to the venous sinuses produces no change in the cerebro-spinal fluid except a slight yellow discolouration, and intracerebral haemorrhage and thrombosis produce no other change in the fluid than a rise in pressure.

Conclusion

Examination of the cerebro-spinal fluid does not always, in itself, give a positive diagnosis. It is, however, a valuable supplement to the routine history taking, physical examination, and other laboratory tests, and a very useful aid in arriving at a correct diagnosis.

REFERENCES

Physiological Basis of Medical Practice. Best and Taylor.
Text Book of Pathology. Boyd.
Text Book of Medicine. J. J. Conybeare.
Clinical Examination of the Nervous System. Monrad Krohn.
Weed. The Cerebro-Spinal Fluid. Jour. of Anat. Jan. 1938.
Hutchison and Hunter. Clinical Methods.
Beesly and Johnson. Manual of Surgical Anatomy.

DYSMENORRHOEA

By EVELYN K. JOHNSTON, B.A., '40

It has been estimated that 35% of adult women suffer from some form of menstrual pain. Dysmenorrhoea is that form which occurs characteristically during menstruation in contrast to menorrhagia, which is premenstrual and relieved by the onset of the flow.

Incidence.

Dysmenorrhoea occurs most commonly in women who are unmarried, nulliparous, and those who lead a sedentary life. It commonly begins two or three years after puberty, and disappears after the age of 35, or is relieved by the first pregnancy. It has also been known to appear after attenuated tuberculous infection not located in the uterus or ovaries.

Clinical Features.

The pain of dysmenorrhoea is of two types—abdominal discomfort which persists throughout the period, and acute pain which occurs coincident with, or slightly before, the onset. The pain is usually of a crampy nature, beginning in the midline of the lower abdomen, or in the lumbar or sacral region of the back. It may last a length of time varying from a few hours to three or four days, and it is accompanied by a varying degree of malaise, anorexia, nausea and vomiting, headache, and sometimes loss of vasomotor control as evidenced by coldness of the hands and feet. Leukorrhoea may be present for a few days before or after the flow. In some cases skin eruptions are seen at this time.

The pain of dysmenorrhoea is true visceral pain, but there may be a referred element as well, which is appreciated in the area of skin supplied by the first lumbar nerve. Painful spasm of the bladder and rectum is an accompaniment in certain types of case.

Hormonal Influence on the Uterus.

The follicular hormone known as oestrin or folliculin is responsible for the growth of the uterus and endometrial glands. Two forms of the hormone have been isolated, oestrone or theelin, and oestriol or theelol. Another substance with similar activity has been isolated from placental tissue by extraction with acetone, and is known as emmenin. These substances are spoken of as oestrogenic.

When the Graafian follicle discharges its ovum, it develops into a corpus luteum which produces an hormone known as lutein, progestin, or progesterone, this hormone being responsible for the pseudo-decidual reaction of the premenstrual uterus. The corpus luteum persists for about ten days, and then, unless fertilization has occurred, regresses. When the influence of progestin is removed, the pseudo-decidua undergoes molecular disintegration, and menstruation follows. Progestin is spoken of as gonadotropic.

The production of oestrin and progestin, in turn, depends on the activity of the anterior pituitary gland. Two ovarian factors are secreted by this gland—prolan A, the follicle-stimulating principle, and prolan B, the luteinizing principle.

It is generally agreed that oestrin sensitizes and progestin desensitizes pituitrin, the posterior pituitary hormone which stimulates uterine contractions. Oestrin is produced constantly, while progestin is produced only during the life of the corpus luteum.

Aetiology of Dysmenorrhoea.

The two extremes of thought concerning the cause of dysmenorrhoea are, on the one hand, that it is always due

to purely mechanical factors, and on the other, that it is purely psychogenic in origin. Actually there is no single explanation for all cases of dysmenorrhoea. Since uterus, ovaries, other endocrines and the autonomic nervous system are all involved, it is possible that a physical or functional defect in any one may be responsible.

The psychogenic theory of dysmenorrhoea was championed by Menge, who argued that the normal uterine contractions were interpreted as labour pains by the psychoneurotic woman. Since pain has its individual pathways in the spinal cord, such a misinterpretation is unlikely, but it is possible that a psychogenic factor might be responsible for exaggerating the pain.

The nature of the pain of dysmenorrhoea suggests that it is due to disordered contractility of uterine muscle, so that the fundamental cause would seem to be concerned with the control of contractility.

Contractions occurring every two minutes and reaching a force which would exert a pressure of 100 millimeters of mercury have been demonstrated to be present in the wall of the uterus just before, and during menstruation. Contractions of this order are not accompanied by pain. In spasmodic dysmenorrhoea, however, intrauterine pressure as high as 180 millimeters of mercury have been recorded, the critical pressure for the occurrence of pain being 120 millimeters. This suggests that the pain of dysmenorrhoea is analogous to that of intermittent claudication and angina pectoris, being due to muscular contractions in a temporarily ischaemic organ.

It has already been mentioned that oestrin favours uterine contractions while progestin inhibits them. Thus it follows that excessive oestrin production, or deficient progestin production might be responsible for the increased force of contraction. Kotz and Parker found in several patients with dysmenorrhoea, high levels of oestrogenic substances and normal or subnormal levels of gonadotropic substances in the blood. Their work indicated that the low level of progestin was secondary to hyposecretion of the prolan B factor of the anterior pituitary gland.

Whitehouse explains the so-called membranous dysmenorrhoea on the basis of oestrin deficiency. Sometimes the menstrual discharge comes in spurts instead of seeping gradually through the mouth of the cervix, and contains chunks of endometrium, which are not present if separation of the pseudodecidua has occurred by molecular disintegration which is the normal manner. In such cases there has been marked decidual reaction, whch is inferred to be due to overactivty of the luteal hormone. The fact that the pain is often premenstrual as well as menstrual suggests that it is due to separation rather than expulsion of the membrane. Abnormal separation may be associated with the relative insufficiency of oestrin.

There is also the possibility that sympathetic overstimulation is responsible for the excessive contractions of the uterine muscle. The uterus can contract rhythmically without nervous stimulation, but normally the nerves probably do exert some influence on uterine motility. The sympathetic nerve supply of the uterus comes through the presacral nerve, which derives its fibres from the coeliac plexus and lumbar ganglia. It lies anterior to the bodies of the fourth and fifth lumbar vertebrae between the common iliac arteries and descends towards the hollow of the sacrum. Its fibres are joined by parasympathetic fibres from the nerve erigentes and the uterine muscle is supplied from the ganglia cervicalia uteri which are situated on either side of the vagina. Experiments on monkeys performed by Zuckermann indicate that sympathetic stimulation causes contraction of the circular fibres of the lower uterine segment and inhibits the longitudinal fibres of the body of the uterus. Parasympathetic stimulation has the opposite effect.

This type of stimulation is similar to that of bladder and rectum.

The type of cystalgia found associated with dysmenorrhoea is characterized by frequent micturition and spasm of the sphincter. Rectal spasm and severe constipation are also present sometimes. The disturbances of all three organs might be explained on the grounds of overactivity of the sympathetic nervous system. The imbalance between sympathetic and parasympathetic stimulation has been attributed by different people to psychogenic and inflammatory phenomena.

The latter suggestion is borne out by findings on microscopic examination of sections of presacral nerve removed at operation from patients with dysmenorrhoea. In the majority of cases in which such examinations were made, the nerve was found to be altered in the direction of a subacute or chronic neuritis. The pain might be explained as arising from exaggerated motor or sensory impulses arising in a nerve made hypersensitive by inflammatory changes.

Schwarz and Smith report a series of twelve cases in which allergy apparently played a part in the aetiology of dysmenorrhoea. Eight of these twelve cases gave a family history of allergic phenomena of one sort or another, and most of the patients themselves had other manifestations of allergy. Complete or partial relief was obtained by eliminating the substances concerned from the diet.

Dysmenorrhoea may be found secondary to tumours, malformations, or inflammatory conditions of the uterus, or in cases of edometriosis. Endometrial implants undergo cyclic changes along with the uterus, and if they are so placed that the blood cannot escape, pain may develop as a result of the tension produced.

Dysmenorrhoea has also been reported in cases of hypoglycaemia with a fasting blood sugar below 80 mg. %, this dysmenorrhoea being relieved by administration of carbohydrate.

Treatment.

Acute attacks of dysmenorrhoea are relieved by codeine or the coal-tar analgesics along with rest in bed, hot applications and hot drinks. In severer cases atropine sulphate grains 1/120 every four hours, starting a day or two before the onset, may relieve.

For permanent relief, constitutional disease such as anaemia, hypo-thyroidism must be treated. A careful history must be taken to eliminate the possibility of allergic or psychic factors.

Specific therapy is of two types—endocrine and surgical.

Gonadotropic substances, progestin (progesterone) or proluton, antuitren S, follutren and A.P.L. are indicated for the patient with a well-developed uterus exhibiting moderate to large contractions. A similar effect is obtain-

CANADIAN LABORATORY SUPPLIES
LIMITED

Canada's Leading Laboratory Supply House.

Headquarters in Canada for
LABORATORY APPARATUS
AND CHEMICAL REAGENTS

TORONTO-5, ONT.
Hartz Building. 32 Grenville Street

MONTREAL, QUE.
296 St. Paul Street West

WINNIPEG, MAN.
Phoenix Building 388 Donald Street

SAINT JOHN, N.B.
108 Prince William Street

ed by radiation of the pituitary gland with a view to stimulating it to secrete more prolan B.

Oestrogenic substances, theelin or oestrone and emmenin are indicated for the patient with an hypoplastic uterus or with membranous dysmenorrhoea.

Three surgical procedures are used: cervical dilatation, alcohol injection of the cervical ganglia and resection of the presacral nerve. Cervical dilatation may be followed by complete, partial, or no relief, and any relief obtained may be only temporary.

Alcohol injection is done to block the afferent impulses arising in the uterus, the treatment being analagous to that in trigeminal neuralgia.

If all other measures fail and the patient is suffering from incapacitating dysmenorrhaea, resection of the presacral nerve may be done. This procedure is almost invariably successful, any failure being due to incomplete resection of the nerve. Future pregnancies have not been attended by accidents referable to the nerve section.

BIBLIOGRAPHY.

M. C. WATSON—Treatment of Dysmenorrhoea with Emmenin. Can. Med. Jour. June, 1935.

W. P. KENNEDY—Endocrine Therapy in Dysmenorrhoea. Brit. Med. Jour. April, 1932.

W. SHAW—Treatment of Spasmodic Dysmenorrhoea. Lancet, July, 1933.

W. SHAW—Discussion of Intrinsic Dysmenorrhoea. Proc. Roy. Soc. Med. June, 1936.

EMEL NOUOK—Treatment of Primary Dysmenorrhoea. Am. Jour. Med. Sc., Feb., 1933.

EHRENFEST—Menstruation and Its Disorders—review of literature (1933-36). Am. Jour. Obst. and Gyn., 1937.

LACKNER, KROHN and SOSKEN—Etiology and Treatment of Primary Dysmenorrhoea. Am. Jour. Obst. and Gyn., 1937.

KOTZ and PARKER—Primary Dysmenorrhoea—an Endocrine Problem. Am. Jour. Obst. and Gyn., 1937.

D. J. CANNON—Oldest Theories and Newest Treatment of Dysmenorrhoea. Jour. Obst. and Gyn., Feb., 1937.

D. J. CANNON—Modern Theories of Dysmenorrhoea. Jour. Obst. and Gyn., June, 1936.

GASTON COTTE—Resection of Presacral Nerve in Dysmenorrhoea. Am. Jour. Obst., and Gyn., 1936.

Don't Forget---

The Medical At-Home Dance

WITH

BUNNY BERIGAN

AND

KARL MUELLER

THURSDAY, JANUARY 26th

ROYAL YORK HOTEL

Dancing 9 p.m. - 3 a.m.

THE PROBLEM OF A LUMP IN THE BREAST

By W. A. ROWLAND, '40

Awakening public interest has stirred women to seek advice for lesions of the breast at a stage much earlier than formerly. This has resulted in a greater knowledge of the subject and a greater opportunity of dealing with malignant disease so that whereas formerly the vast majority of cases associated with a lump in the breast were malignant, latterly the great majority are benign.

Upon examining a woman who complains of a single lump in the breast we must decide whether the condition under diagnosis is a *tumour* or an *inflammatory swelling*. The margin of a tumour is usually abrupt and well defined, that of an inflammatory swelling diffuse, shelving, and oedematous. If the swelling is due to trauma there will be no constitutional disturbances, if due to an acute infective process there will be marked constitutional disturbances. In both chronic inflammatory conditions and carcinoma, constitutional disturbances are usually not found. The next point to determine is whether the tumour or inflammatory swelling is fluid or solid. If the tumour be fluid and translucent on transillumination, it is a cyst or cystic degeneration of a previously existing solid tumour. The fluid of an inflammatory swelling is pus. If the presence of a tumour has been established we must further determine whether it is benign or malignant. When carcinoma exists it is hard and stony, surface uneven, margins hard and abrupt and may be fixed to surrounding structures. The size of a tumour has no relation either to the diagnosis of carcinoma or to its degree of malignancy. Lymphatic glands enlarged as a result of an infective process, rapidly increase in size, are usually soft, become confluent and give rise to pain increased by palpation. Those glands affected by carcinoma are usually hard, solid, discrete and painful.

Haematoma

Under certain conditions, haematoma of the breast resulting from injury may simulate carcinoma so closely that the differentiation of the conditions is extremely difficult. The clinical signs and symptoms which distinguish a haematoma from a carcinoma are as follows: a definite injury applied to the breast in which no lump has previously been noted, followed immediately by the appearance of a tumour; a history that the tumour is either stationary or diminishing in size; an absence of enlarged axillary lymph glands. Haematomata regress very slowly and if one decides to await the possibility of the disappearance of the swelling several weeks may be necessary to establish the fact that the tumour is decreasing in size and if it is due to carcinoma, much valuable time has been lost. Transillumination of a haematoma gives a characteristic appearance; the shadow is very dense, darker in some parts and lighter in others, the edges are irregular. The shadow cast by carcinoma is much lighter, fairly homogeneous, with more regular edges.

Fat Necrosis

On the superficial parts of a fat breast, fat necrosis appears clinically as a solid painless lump with well defined edges and is adherent to the skin. There may or may not have been a history of injury to the part affected. Its clinical signs are those of a carcinoma with the exception that the axillary lymph glands are not palpable. The safest method of diagnosing the condition is to perform a local incision examining the tumour tissue microscopically, being prepared at the same time to proceed with a more radical operation if necessary.

Lactation Mastitis

Acute infective inflammation occuring in a breast during lactation may simulate acute carcinoma so closely that a differential diagnosis based upon the clinical signs alone may be impossible. The skin is red and warm and the breast swollen, painful and tender. The axillary lymph glands may be enlarged and of firm consistency. There may be no evidence of suppuration but the presence of fever and leucocytosis and the toxic appearance of the patient are indications of an infective process.

Acute Mastitis.

The onset of this condition is sometimes sudden. During the acute stage the entire gland is firm and tender, the skin is inflamed and the axillary lymph glands are enlarged, confluent and painful. There is moderate fever. In the chronic form of the disease all signs of inflammation have disappeared and the picture is one typical of carcinoma. The diagnosis is made upon the history of inflammation and by the fact that carcinoma when complicated by an inflammatory process always progresses and never regresses as does acute mastitis.

Fibroadenoma.

A smooth, solid, freely movable round or lobulated tumour occurring in the breast of a female under the age of 25 years justifies the diagnosis of fibroadenoma. Beyond this age the probabilities are that it is carcinoma or a tense cyst, while after the age of 35 it is more than likely that the tumour is a carcinoma. The differentiation of a carcinoma from a fibroadenoma is simple when the tumour is adherent to the skin or adjacent structures and when there are enlarged axillary glands. Therefore in the absence of these signs the only method of diagnosis is local incision with full preparation for an immediate radical amputation should the growth be found malignant by the pathologist.

Cysts.

These are commonly of three varieties. A *galactocele* is a rare condition associated with lactation and generally situated in the ampullary region. They are painless, circumscribed and doughy in consistency, gentle pressure releases milk. The cysts are freely movable. *Cystic Hyperplasia* is a condition that may simulate carcinoma when a single cyst is very tense and deep seated. If any doubt exists, aspiration should be done. When we have two or more tumours in one or both breasts, the condition is one of multiple cysts or fibroadenomata. When a single cyst has reached large proportions it may present signs by which it may be distinguished from carcinoma. Its walls are smooth and sharply defined, it is freely moveable, fluctuation may be detected, and enlarged lymph glands are absent. Furthermore the pain associated with chronic mastitis is related to menstruation, the pain becoming more intense just before the menstrual period. *Cystic degeneration in a tumour* may occur in a fibroadenoma that has reached large size and in late stages of a carcinoma. Cysts that contain clear fluid are translucent in whatever part of the breast they may be situated and can by transillumination be differentiated from solid tumours. Unless simple cysts are inflamed they are not adherent to adjacent structures. Uncomplicated cysts contain a clear straw coloured fluid, whereas those complicated by benign or malignant neoplasms may contain blood or serosanguinous fluid which may exhibit benign or malignant epithelial cells. The problem of cysts must be considered carefully, every cystic swelling should arouse suspicion as to its exact nature. It might be a cyst containing a papilloma or cystic degeneration of a carcinoma and there may or may not be glands palpable in the axilla.

Lipoma.

A lipoma situated on the anterior surface of the breast presents definite

features of softness, lobulation, and encapsulation, making the differential diagnosis from carcinoma a simple matter. When a lipoma is situated deeply, diagnosis may then only be made upon exploratory operation.

Papilloma.

The average of patients who have papillomata is 40 years. Palpation of the breast may be unable to detect the existence of a papilloma. When a tumour is felt in the ampullary region, with oval contour, its long axis radiating from the nipple, with well defined edges due to distended duct walls, it is possibly not a carcimona but a papilloma. Both carcinoma and papillomata cause bleeding from the nipple and the axillary glands need not be enlarged. Transillumination should be used to localise the growth and render local excision much easier.

Carcinoma.

This occurs at all ages and is most common between the ages of 40 and 60 years. The examination of the patient should begin at the moment she comes into sight, making mental reservations and considerations while listening to the account of her trouble. The investigation should proceed along the following lines:

1. *History.*—The course of the patient's weight should be enquired about. The sequence in which the symptoms appeared, which was the first to appear, the lump or the pain, should be noted. If it is found that the lump is sometimes larger and sometimes smaller it is definite evidence of its having been produced by either traumatism, infection, or by functional disturbance. If the nipple has been gradually retracting during the last few months, it is definite evidence of malignant disease. A discharge also indicates either traumatism, duct papilloma, chronic mastitis or carcinoma. A history of pain in the spinal column, ribs, or femur is suggestive of malignancy. Pain is the only subjective symptom of mammary carcinoma.

2. *Inspection*—(a) *The contour of the breast.* No matter how pendulous a normal breast is, its contour always forms the perfect arc of a circle. Any interference in the arc by localized flattening or swelling indicates the presence of an underlying carcinoma, tuberculosis, or infected cyst.

(b) *State of nipple.* In general, gradual retraction of a nipple is pathognomic of carcinoma. However, carcinoma may occur without retraction.

(c) *Condition of the skin.* Puckering or dimpling of the skin is almost pathognomic of carcinoma but its absence does not exclude this condition. Peau d'orange, the presence of ulcers, and the presence of multiple, hard, discrete nodules, scattered over the skin of the breast are definite indications of carcinoma.

3. *Palpation.* — In carcinoma the overlying skin may have an increased temperature. The nodule may be tender to palpation and pressure may lead to a sharp stabbing pain. If there is a definite palpable stony, hard lump we may call it cancer if it is well defined, inflammatory if it be diffuse. The size of a growth is no indication of its malignancy. Fixation as brought into view by gentle skidding palpatory movements is indicative of carcinoma. Fluctuation occurs in cysts but the absence of fluctuation does not rule out cysts nor does its presence rule out malignancy. A discharge from the nipple may be either (a) blood, (b) serum, (c) thick greenish fluid, (d) white fluid. The most frequent cause of spontaneous and intermittent discharge of blood from the nipple is a papilloma. It may also indicate a duct carcinoma or also trauma. A spontaneous and intermittent serous discharge from the nipple may be associated with a slight infective process in the ducts of the nipple or carcinoma.

A thick greenish discharge usually occurs in young married women who have borne children and is the result of retained secretions which stagnate. It is usually unassociated with carcinoma but may occur in cystic hyperplasia (chronic mastitis). A whitish discharge may be milk, pus, or malignant epithelial cells. Thus one may conclude that the presence of any discharge is highly suggestive of carcinoma. Axillary lymph nodes are palpable in only about one half of the cases of cancer of the breast. This is particularly true in those women who have an abundance of axillary fat. In some instances firm fat may simulate the feel of nodulated glandular tissue. Again in some instances there may be involvement of the supraclavicular glands without any axillary involvement.

4. *Transillumination.*—This is a very useful procedure enabling one to differentiate between solid and cystic tumours, and to localize tumours, thus enabling easier approach for local excision and biopsy.

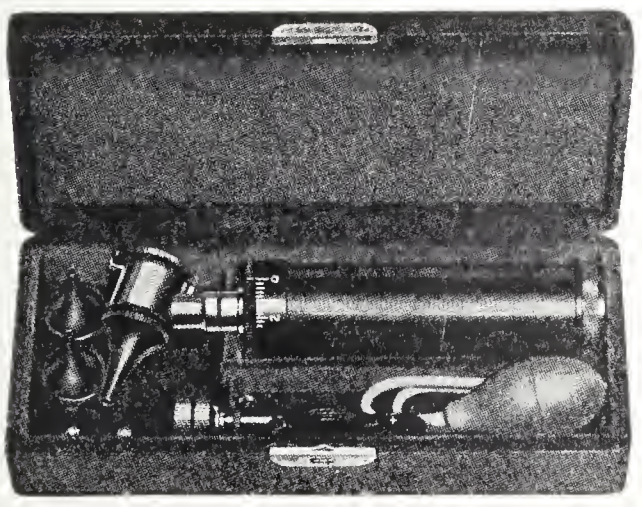
5. *Other Investigations.*—The lungs should be examined for the physical signs of metastases and also by X-ray. Enlargement of the liver, ascites, uterine displacement and signs of adnexal disease, should be sought for. Tenderness of various parts of the skeletal system should be looked for and all suspected areas X-rayed. Aspiration is a valuable aid in some respects but valueless when it is realized that information regarding the surrounding breast tissue is not obtained.

Summary.

Upon examining a woman who complains of a single lump in one breast, certain conditions may be responsible. Broadly speaking a solid localized nodularity or lump occurring in one breast of a woman over 25 years of age is due to, with rare exceptions, either a fibroadenoma, carcinoma, or multiple cysts or papillomata affecting one breast is usually a fibroadenoma or more rarely a pure adenoma. Multiple tumours of a breast are most commonly, cysts, multiple papillomata, multiple fibroadenomata, and in rare cases, multicentric origin of carcinoma.

REFERENCES.

1. BOYD—Text Book of Pathology.
2. R. M. JANES—Can. Med. Ass. Journ. p. 531, Nov., 1936.
3. W. F. GILLESPIE—Can. Med. Ass. Jour. p. 555, Dec., 1937.
4. BEHAN—Cancer.



FOR MORE PRECISE DIAGNOSIS

We invite your inspection of the

Welch-Allyn Ophthalmoscope
and Other Diagnostic Instruments

The J. F. HARTZ CO., Ltd.
PHYSICIANS' SUPPLIES

34 Grenville Street, Toronto.

THE PHYSIOLOGY OF ESSENTIAL HYPERTENSION

By T. S. WILSON, '41.

In scientific reading or discussion, one must distinguish between fact and theory; between what is known and what is surmised. High blood pressure is a fact—there are many theories to account for it. Far too often we are imbued with the theory of the present which we take as fact, and ridicule older ideas. A lesson may be learned from the words of Pope:

"We think our fathers fools so wise we grow,
Our wiser sons no doubt will think us so."

Anyone reading this article should keep an open mind remembering that the latest news is not always the correct news.

Physiology

Essential Hypertension may be defined as lasting or chronic high blood pressure for which there is no known cause. Our text books tell us, and quite truthfully, that arterial blood pressure depends on a number of factors, chief of which are (1) the pumping action of the heart or minute output and (2) the peripheral resistance. A great and continuing increase in this pressure could not possibly come from a long continued increase in minute output, as it does momentarily in violent muscular exercise. Indeed we can measure minute output accurately, and find it is not increased. The increase in blood pressure must therefore be due to an increased resistance which the blood encounters in its flow from arterial to venous systems, and most of this resistance is met with in the arterioles. These arterioles have become narrowed in diameter, and it takes longer for the blood to pass through than normally—just as it takes longer to empty a quart of beer encased in a narrow necked bottle than a quart of milk in a wide necked one. The effect of this is to increase the amount of blood in the arterial system, and so to increase the lateral pressure—the blood pressure—on the walls of the vessels. Evidence of the narrowing of arterioles may be seen in the retina on ophthalmoscopic examination when they appear as silver threads. The narrowing of the vessels is not simply a spasm, which signifies a contraction lasting for short periods, but is rather a sustained contraction.

It is thus easy to arrive at the initial cause of the rise in blood pressure. Having gone this far, we may ask ourselves the question: What causes the arterioles to contract? And here let it be noted, we leave fact behind, and begin theorizing.

History

Before the time of blood pressure determinations in man, Richard Bright observed that renal disease and cardiac hypertrophy often ran hand in hand, and he believed that renal disease was primary. For the purpose of this article we will assume that hypertrophy of the heart—though many disagree—may be caused by an increase in resistance which the blood meets as it goes from heart to aorta—that is, by an increased blood pressure. Bright's assumption then boils down to the theory that renal disease gives rise to hypertension. Later workers pooh-poohed this idea, or agreed with it in kind but not in degree. Many cases of chronic high blood pressure were cited in which there were no clinical evidences of renal disease; it is surprising however that very few kidneys at autopsy of patients with hypertension are without lesions, and some say lesions can always be demonstrated. Of course they may be the result, rather than the cause of the

high blood pressure. Gull and Sutton were of the opinion that hypertension was the result of a constriction of peripheral vessels due to organic atheromatous change in them. There still remained to be explained the cause of the arteriolar disease. Again other workers suggested that the atheromatous change was the result, rather than the cause of hypertension. This last has been proven to be true of the general peripheral vessels. Nervous theories have been advanced: that the constriction was due to an imbalance of vasoconstrictor and vasodilator nerves to the vessels and this was supposed to account for the hereditary tendency. But this also has not stood the test of time and has been thrown into disrepute. Pressor substances, such as guanidine which is a product of protein metabolism, have been thought to be, so to speak, the nigger in the wood pile. Amid a maze of scientific theories, that of Goldblatt alone comes to the fore. He believes firmly that Essential Hypertension is due to a decrease in blood supply, to ischemia of the kidney. It is surprising that after a long period when the kidney theory was jeered at, we are coming around to the opinion once again that it is the moving influence in causing Essential Hypertension.

Experimental Hypertension

One must be careful of pitfalls in all experimental findings. Just because a condition, disease or lesion can be produced in the experimental animal by some method or other, it does not necessarily mean that it is produced in the human in the same way. For example, peptic ulcers can be produced experimentally in animals in a dozen different ways: it would be foolish to suppose that ulcers are produced in man by all of them. So with hypertension.

Experimentally, lasting hypertension has been produced in animals in three ways:

(1) By cutting down the blood supply to the kidney.
(2) By removing the carotid sinus and aortic nerve.
(3) By cutting down the blood flow through cerebral vessels.

It does not seem possible that hypertension in man is produced by the second method, because very often the carotid sinus reflex is more active in people with hypertension, pressure on the sinus causing peripheral vaso dilatation and a depressor response. The block in the cerebral vessels causes a decrease in the blood supply to the vaso constrictor centre increasing its tone, and hypertension in man might conceivably happen in this manner. However, it seems much more likely that hypertension is produced through the kidney, particularly as nearly always some kidney arteriolar atheromatous change, which would cause a partial occlusion of vessels and so a decrease in blood supply may be demonstrated.

Hypertension Caused by Renal Ischemia

Much experimental work has been done, and the kidneys tampered with in every conceivable way, to show that there is a relation between the kidneys and hypertension. One or both kidneys have been removed, one and a part of another, just a part of one, renal artery or vein or their branches clamped, the ureters blocked, and so on. In all the experiments no one clear fact emerges. Evidence on one side has been contradicted with equal scientific exactness by the other! But Goldblatt using as a hypothesis that essential hypertension was due to arteriolar sclerosis in the kidney, attempted experimentally to reproduce the pathological effects of arteriolar sclerosis—narrowing of lumen. He produced the narrowing of the vessels by clamps which would decrease the blood flow but which would not close it off entirely as other workers had done. Persistent hypertension lasting over a period of five years was produced in one dog by partial occlusion of both renal arteries with an interval between occlusions,

and in another by partial occlusion of its renal artery and then removing the other kidney. He has also produced chronic hypertension in the monkey by the same methods. It might be argued that the cause of the hypertension was due to decrease in the vascular bed, but there was a greater decrease when both kidneys were taken out, and in this case there was no chronic hypertension produced. Also constriction of femoral and splenic vessels decreases the vascular bed yet causes no lasting hypertension. Partial constriction of the aorta above the origin of the renal vessels causes a hypertension of long duration; constriction below causes none. This fact alone would seem significant, and that the kidneys were connected in some way with the increase in blood pressure.

How then can we correlate this ischemia of the kidney with hypertension? Since the increased blood pressure must be due to an increase in peripheral resistance, why does renal ischemia cause constriction of peripheral arterioles? Is some nervous impulse arising in the kidney which stimulates the vasoconstrictor centre in the medulla responsible, or is some hormonal factor involved? Since the hypertension can still be obtained by transplanting the ischemic kidneys, this excludes the possibility of nervous reflex. The blood pressure falls as soon as the ischemic kidney is removed, so it must be present for the continuance of hypertension. If the renal veins of the ischemic kidney are clamped, the blood pressure falls. We can infer from this that if a pressor hormone is liberated from the ischemic kidney, it cannot pass into the general blood stream with the vein clamped. No pressor hormone has ever been demonstrated either in the blood of the human with hypertension, or in the animal with experimental hypertension.

Goldblatt next tried the effect of removal of certain of the ductless glands. Removal of the pituitary in animals with hypertension does not lower blood pressure. Removal of one adrenal gland completely, and the medulla of the other, does not lower it either. If however both adrenal glands are removed completely, and the animal kept alive by salts injection, the blood pressure drops immediately. It is sound reasoning to draw from this that the active principle of the ischemic kidney—if such exists—acts through the cortex of the adrenal gland to cause a peripheral vasoconstriction, and so an increase in blood pressure. It has been shown that there is no increase in adrenaline secretion by the adrenal medulla in this type of hypertension.

Possible Application

The surgical treatment in patients with essential hypertension has been to cut the great splanchnic nerves and remove the coeliac ganglia. The effect of this is to decrease vasoconstrictor impulses going to the splanchnic vessels, and so of causing a vasodilatation. The blood pressure drops immediately in all cases, then rises again, but does not rise as high as before, and better still the chief symptom—headache—does not come back. If we believe that essential hypertension is due to a decreased blood supply to the kidney, an obvious surgical procedure would be to increase the accessory circulation. Experimentally, the capsule of the kidney has been removed, and muscle attached to the parenchymal surface. With this set up, hypertension does not develop when the renal vessels are clamped. It would be unwise to prophesy that such an operation will be in vogue at some future time, but sometimes the myths of today are the realities of tomorrow.

BIBLIOGRAPHY:

Harvey Lectures 1937-38.
Physiological Basis of Medical Practice. Best & Taylor.
Textbook of Physiology. Samson Wright.

The writer wishes to thank Prof. N. B. Taylor for reading and criticizing this article.

C.A.M.S.I. NOTES

By D. H. COPP, B.A., '39

At Toronto, interest still centres around the problem of student health. The most promising advance was the institution by the faculty this fall of a system of routine tuberculin testing of all students, with optional testing and immunizing for Scarlet Fever and Diphetheria. All positive reactors to the tuberculin test are given chest plates at the low rate of two dollars, with specialist advice when indicated. This is a definite step forward in the control of our chief occupational hazard.

An extensive health survey among the students was conducted just before the Christmas holidays, and the results should be ready for the January convention. The interest and cooperation of students has done a great deal to make this survey worth while. The committee on student health plans to use this survey in conjunction with a study of health service in other universities to consider a possible service suitable to our needs at Toronto. Such a Health Service would probably include:

(1) Annual thorough Health Examination, with lab. work as indicated, and check up on any defects found.
(2) Tuberculin test, and X-Ray plates.
(3) Part time physician who would act as a consultant.
(4) Free hospitalization, medicines, etc.

Such a service should cost in the neighbourhood of $4 or $5 per year.

A plan is also being advanced to facilitate uniform interne appointments by all hospitals at one definite date. The plan is being worked out in conjunction with Dr. Agnew, Chairman of the Department of Hospital Service of the Canadian Medical Association. The proposal is that senior medical students file an application with a central bureau, listing the hospitals at which they wish to interne in the order of preference. Applications are also sent to the hospitals concerned. The hospitals, in turn, will submit to the central bureau their list of preferences, and appointments will be adjusted. Final appointments will all be announced on the same day. It is felt that such a scheme will do a great deal to overcome the confusion that now prevails in interne appointments, and will help to place the medical student in a hospital of his choosing.

At present, there are signs of CAMSI interest and activity in six of the eight Canadian Medical Schools. Thanks to a cooperative agreement with the A.M.S., the A.M.S. Journal is being delivered to each Canadian medical student, and a page devoted to C.A.M.S.I. news is to be printed in it.

By the time this appears, plans will be well under way for the second National Conference, to be held at Toronto on the week end of January 28. All those interested should get in touch with Mr. Paul McGoey or Mr. Bill Ortved. The agenda will include student health, interne welfare, and national organization.

SUBSCRIBERS ARE RESPECTFULLY REQUESTED TO PATRONIZE FIRMS ADVERTISING IN THE JOURNAL.

Feature Section

J. C. McCULLOCH, EDITOR

A SUMMER AMONG THE INDIANS OF BRITISH COLUMBIA

By BILL SERVICE, 3T9

Last spring it was my good fortune to be appointed assistant, for the summer months, to Dr. Darby, the Medical Superintendent of the R. W. Large Memorial Hospital at Bella Bella, British Columbia.

I arrived at Bella Bella on Sunday morning, May 28, on board one of the steamers from Vancouver. It was a thirty-two hour trip for Bella Bella is about two-thirds of the way from Vancouver to Prince Rupert. The village is situated on an island fifteen miles from the mainland and on one of the two coast channels. It is a very picturesque spot for there are many thickly wooded islands between Bella Bella and the mainland, and as a background the coast range of mountains rises to great heights, snow-capped throughout most of the year.

This Indian village is typical of the many scattered along the coast, but the standard of living, moral code, health and education, are better than in most because of the combined work of the hospital, school and church.

The hospital delighted me greatly for though it was small, with under fifty beds, it was very well equipped and, as I was to learn, exceedingly well staffed. The operating room was equipped for any eventuality. This was Dr. Darby's particular pride for he is above all a surgeon. It had also a very fine X ray room, service room, dispensary, delivery room, public and private wards.

The first four days were spent chiefly in getting acquainted with the lay-out of the hospital, the staff, and the routine. Dr. Darby announced shortly after I arrived that he was going to Rivers Inlet to open the summer hospital and was leaving me in charge. There were a number of operations, mostly tonsils, which he had lined up and for these I gave the anaesthetics. I had expected that this would be one of my duties so I spent three days before leaving Toronto at The Sick Children's Hospital where they kindly gave me instruction and practice in ethyl chloride and ether anaesthesia.

To be left in charge of the hospital was a very sobering experience. Dr. Darby was sixty miles away, a nine hour trip in our launch. No one else was available for consultation, the whole responsibility for diagnosis and treatment lay entirely in my hands. It was during this period particularly that I was impressed with and grateful for the efficiency of the nursing staff. They had all been well trained and their experience in this kind of work gave them a great range of knowledge. Though diagnosis is out of a nurse's province yet on several occasions they gave me the correct suggestion which enabled me to make the diagnosis. I learned a great deal from them. In my first delivery the nurse was just going to hand me the umbilical tape to tie the cord. In my previous obstetrical experience at St. Michael's Hospital I had applied Ziegler clamps and did not know the correct technique of tying the cord so told the nurse to go ahead. I watched her eagerly and learned a good technique without her realizing it.

I had two obstetrical cases in the three weeks I was at Bella Bella and from them and subsequent cases I discovered that Indians are not the people

on whom to learn obstetrics. Few are incapacitated at all during pregnancy, most have no morning sickness. Labour is usually very short and easy. Ether is necessary in the second stage, not so much to decrease pain as to retard the expulsion of the child for this stage is very rapid.

I went to Bella Bella feeling, because of the character of the fifth year training, that most of the medical cases would be very serious ones such as lobar pneumonia, tuberculosis, congestive failure, acute nephritis, etc., but I found that these conditions comprised only a small fraction of the cases which we saw. Of course among the Indians tuberculosis is quite a common disease and we did see a great deal of it. But the bulk of the people coming to the hospital complained of minor conditions which did not need hospitalization. The Indians are great believers in medicine and we got some remarkable cures when we switched from white to pink aspirin, both five grains.

At the end of three weeks a doctor arrived at Bella Bella to take over the work there for the summer and I went down to Rivers Inlet with Dr. Darby. The hospital is run there because of the tremendous increase in population of the Inlet during the fishing season. Most of the Indian villages, including Bella Bella, are nearly deserted in the summer when the Indians leave for the fishing grounds. At Rivers Inlet, a fjord about twenty-five miles in length, the population in the winter is approximately a hundred whereas this summer there were seventeen hundred fishermen plus their wives and families.

On the Inlet there are nine canneries, five actively canning while the other four serve only as fish camps. We had an arrangement whereby each fisherman would contribute $1.50 for the season and the canneries a like amount. In return we visited the canneries weekly and provided hospitalization, medicine, etc., for the fishermen and their families.

Because of this arrangement the hospital boat was in use most of the time and either Dr. Darby or I would visit the canneries, the other staying at the hospital. We would start out early in the afternoon and not arrive back until late at night, visiting on each trip at least two canneries. It was most interesting going to the "ranch," the Indian sector of the cannery and passing from one "shack" to the next, seeing in this house an old lady crippled with arthritis, in that house a young lad losing his sight with interstitial keratitis, here a tiny baby which had been crying for several days and couldn't keep its food down, and there someone who had fish poisoning. As there were no dentists on the Inlet and none closer than seventy miles it was necessary for us to pull many teeth. My count at the end of the summer stood at one hundred and sixty.

One of the hardest things to learn was the art of getting a history, making a diagnosis and prescribing treatment in a very short space of time. We were so busy that speed was an absolute necessity and as time went on this gradually came through added confidence and experience. I did not gain much confidence in diagnosing skin lesions, but fortunately, though these were prevalent, they mostly consisted of scabies and impetigo. My confidence was always badly shaken too, when confronted with a crying, sick infant. In most cases when I could not discover any obvious cause for the distress a modification of the feeding formula usually did the trick.

On one occasion I went as the doctor on a trip of nearly three hundred miles mostly on a seventy foot launch the "Thomas Crosby." This boat covers that whole region of the coast the entire year, calling at all the Indian villages, lighthouses, lumber and fish camps, and any place where there is even one family. On this trip there were a lot of routine things to do. Apart from these I sent to the hospital an old Indian with congestive failure, a young boy with a fluctuating tuberculous gland of

the neck, removed a piece of steel from the skin of the nose of a white man and opened a very large tense boil on the abdomen of a young Indian girl.

The most serious injury with which I was confronted was an injury due to an axe, in the left hand of a Japanese causing a compound, comminuted fracture of the second and third metacarpals, and severing the corresponding extensor tendons. He was brought from one of the large canneries sixty miles away by one of the steamers. He arrived on a Wednesday and was going to Vancouver on the following Saturday. When I saw how serious it was I realized I couldn't do a complete job so decided to fix him up so that it would be in the best possible condition when he reached Vancouver. One of the nurses administered the anaesthetic and I tied off several of the vessels, removed the blood clots, freshened the edges, sutured it loosely and put in two drains, one on the dorsum and one on the volar surface of the hand for irrigation with Dakins solution.

These are just a few of the many and varied experiences which crowded my summer. When the end of August came I was very loathe to leave for I had found the work fascinating, and the Indians very likeable people.

CORRIGAN PULSE

Sir Dominic John Corrigan, Bart., M.D. (1802-1880).

He was one of the great physicians and surgeons of his period. He helped to make the Dublin School of Medicine one of the most famous in the Europe of that time.

He did not have any university education, but rather, after completing his preliminary education, became apprenticed to a general practitioner in Maynooth, Ireland. Later he went to Edinburgh where he succeeded in obtaining his degree in 1825. Setting up practice in Dublin, he became physician to Jervis Street Hospital, in 1830, where he had six beds at his disposal. From this meagre source, however, he collected enough material for his famous memoir on "Permanent Patency of the Mouth of the Aorta" (1832). In this work he described the visible pulsation of the arteries of the head, neck and upper extremities.

He showed his characteristic decision and boldness in a very striking way and occasionally asserted his opinions and bore down opposition (of which he was not particularly tolerant), thereby making a few enemies for himself and sometimes becoming embroiled in public controversy. He was "black-balled" when put forward for election to an Honorary Fellowship at the King and Queen's College of Physicians. His natural buoyancy and force of character raised him from defeat and, after ample reparation, he was elected to the Fellowship.

Although cardiac, aortic and pulmonary diseases were his chief interests, he also has other works to his credit, including a cholera map of Ireland in which he charted areas of the country afflicted by cholera.

In 1870 he was elected M.P. for Dublin, largely because he strongly advocated disestablishment of the Church. He did,not, however, achieve the parliamentary success which his friends had predicted for him.

The immediate cause of his death was a left hemiplegia — February, 1880.

Abstracts

D. H. COPP, EDITOR

Contributors: R. L. MACMILLAN J. G. WATT
J. C. McCULLOCH J. C. RATHBUN

PRINCIPLES IN THE MANAGEMENT OF SURGICAL SEPTCAEMIA.

By Frank L. Meleney, M.D., F.A.C.S., *New York, New York. Inter. Abst. of Surg., 67, 513, Surg. Gyn. and Obst., Dec.,* 1938.

The author reviews the principles and methods of the surgical treatment of septicaemia. The article is organized so that it stresses the basis behind the treatment of infections in general, and surgical infections in particular. The pathology of a primary focus and the routes by which organisms may enter the blood stream are described.

The clearing mechanisms of the blood are:

(a) Phagocytosis both by the polymorphonuclear leucocytes and groups of macrophages in various situations.

(b) Immune elements.

After experimental injection of organisms into the blood stream they disappeared in 1-2 hours. Fatal cases showed a later return of the injected organisms to the blood. The organisms are shown to have been removed at the lungs, liver, spleen, bone marrow. Later blood invasion followed the development of secondary foci. A knowledge of the organism present in the blood of a human case of septicaemia is useful in finding the primary focus, and in indicating the method of treatment.

Treatment should first be prophylactic. The handling of puncture wounds, lacerations and minor well-localized infections so as to avoid septicaemia is described. Infected areas should be incised, or excised and drained. If there is an indication of suppurative phlebitis the veins should be tied proximally. Many examples are given. The criterion of success is the absence of organisms in the blood.

Chemotherapy by prontosil and related compounds is discussed and advocated for haemolytic streptococcal septicaemia. For staphylococcal septicaemia the author advocates treatment by bacteriophage. This is done by local application to wounds and by intravenous injection until the blood is cleared.

Daily injections of sera from rabbits receiving vaccines from septicaemia strains of both streptococcus haemolytics and staphylococcus aureus have been found to give good results. The reports of various authors are not convincing of the efficacy of blood transfusions. Good results have recently been reported from non-specific immuno-transfusions. If the distributing focus of the organisms is not cleared, no other method of treatment will be satisfactory. J. C. McC.

A STUDY OF BONE REGENERATION.

By Gustav Levander, M.D., Koping, Sweden. *Surg. Gyn. and Obs.* 67, 705, *Dec.,* 1938.

The author describes a new method of causing bone production in the rabbit. In the light of his experiments he discusses bone formation in the embryo, and following fracture and grafting.

The periosteum of a child has the ability to form new bone; that of the adult has not. Bone formed at the site of an autogenous graft is formed from the surrounding mesenchymal connective tissue; the transplant with its bone cells dies. Alcoholic extracts of normal bone and from bone at the site of a previous fracture produced cartilage and bone formation when injected into rabbit's rectus femoris muscle, in one-third of cases. Watery extracts and other control injections caused only fibrous tissue formation.

The author feels that at sites of fracture or transplanted bone a substance is released, comparable to his extract, which causes the surroundings tissue to form new bone. He believes that, in the embryo, organizers at certain situations cause bone production and that the type of cell present at such places is of secondary importance. He therefore advocates a humoral theory, as against the osteoblastic theory of bone regeneration. J. C. McC.

THE MENTAL COMPLICATIONS OF HEART DISEASE.

By A. H. Gordon *and* W. Cohen—*C.M.A.J., Vol.* 39, *No.* 6.

This paper commences with a survey of the literature on the subject, during the past fifty years. In the last 300 cases of heart disease at the Montreal General Hospital, 20% showed mental changes. Seventy per cent. of these occurred between the ages of 40 and 70 years. This

mental change is probably due to "the dilapidation and breakdown of the circulatory apparatus," plus intensive digitalis therapy with too sudden and severe diuresis. Heart cases with mental changes are more prone to have renal impairment, cardiac failure, coronary artery disease, cerebral vascular disease, and a higher mortality than a similar group of heart cases without mental changes. The more severe and persistent the mental alienation, the graver is the prognosis. J.C.R.

HEAD INJURIES.

A Treatise on the Pathology, Sequelae and Medico-Legal Aspects

By W. O. Stevenson—*C.M.A.J., Dec.*, 1938, *Vol.* 39, *No.* 6.

Pathological Physiology.—In concussion the force of the blow is transmitted equally to all parts of the brain by the cerebrospinal fluid. This causes compression of the superficial capillary circulation. Immediately after this the pressure is removed and succeeded by rebound aspiration of blood into the empty capillaries, giving rise to hyperemia with local oedema. Symptoms are due to this oedema. In contusion-laceration there is the added injury of extravasated blood and tears in meninges or brain. Since the venous pressure is low, a slight rise in pressure will control the haemorrhage. Arterial haemorrhage is usually due to the middle meningeal or the posterior cerebral arteries as the latter pass through the tentorial opening.

Sequelae.—These may be classified as:

(1) *Physical*—(a) With definite damage of the brain are seen cranial nerve injuries, muscular paralysis, sensory paralyses, and Jacksonian epilepsy.

(b) Without brain damage—true epilepsy, glycosuria, and atrophy of the testis, the last two possibly being related to pituitary damage.

(2) *Mental*—Headache and cephalalgia due to residual hematocele or pneumocele; amnesia, automatic states, traumatic neuroses, and true psychoses. J.C.R.

ERYTHEMA NODOSUM AND TUBERCULOSIS.

By K. F. Brandon *and others*—*C.P.H.J., Nov.* 1938, Vol. 29, No. 11.

The occurence of 14 cases of erythema nodosum among 173 boys in a residential school is recorded. All cases appeared among boys from 10-16 years. Eighty-eight per cent of 153 tuberculin-tested boys were positive, and of the 14 cases, 12 were considered as either definite or suspicious tuberculosis. There was no history of preceding sore throat or illness. Eight cases may have been infected by one case of open tuberculosis, while the others were probably due to transmission by direct contact with other cases of erythema nodosum, after the removal of the open case of tuberculosis. An interesting case is cited where a tuberculin-negative individual became violently positive during the course of erythema nodosum. J.C.R.

INDICATIONS FOR CAESAREAN SECTION.

By Ross Mitchell—*C.M.A.J., Vol.* 39, *No.* 6.

This paper is a plea for the limitation of the use of Caesarean Section. It should not be used as a last resort but only when sufficient indication is present. since the maternal mortality for Caesarean Section is 30 per 1,000, as compared with 5 per 1,000 for vaginal delivery. The indications used at the Winnipeg General Hospital are:

(1) Disproportion — True conjugate diameter less than 3-3 ½ inches in flat and less than 3-3 ¾ inches in generally contracted pelves.
(2) Previous Section—Only after a trial of labour.
(3) Central and lateral placenta praevia.
(4) Accidental haemorrhage with utero-placental apoplexy.
(5) Pre-eclampsia where medical treatment fails.
(6) Fibroids or ovarian cysts obstructing labour.
(7) Cardiopaths where sterilization is necessary or a long labour is forseen.
(8) Diabetes with habitual stillbirths.
(9) Atresia of vagina and rigid cervix in elderly primigravidae.
(10) Poor general health, especially in nervously unstable women.

J.C.R.

BRONCHIAL ASTHMA.

Its Diagnosis and Treatment

By Albert H. Rowe, M.D., *Oakland, Calif.*—*J.A.M.A., Nov.* 12, 1938.

Bronchial asthma is an allergic phenomenon. Inhalant allergy, and food allergy play the major roll in the disease, while bacterial allergy has been relegated to a minor role.

The History.—A carefully taken history is of the greatest importance. Correlation of symptoms with foods, medicines, seasons, and environments is imperative. Asthma that is better in summer and worse in the fall, winter, and spring, should suggest food allergy, animal emanation, dust and other inhalant

allergies encountered during these months. The history of recurrent asthma starting at the age of 18 to 20 months, preceded often by infantile eczema, again suggests food sensitization. Bacterial allergy must not be blamed merely because of true or apparent "colds," pneumonia or whooping cough before the original or recurrent attacks.

Differential Diagnosis.

In possible bronchial asthma, one must have the various other cases of dyspnea in mind.

Testing for Allergy.

All patients with possible bronchial asthma or allergic bronchitis should be tested with foods, animal emanations, dust, fungus and miscellaneous allergens, together with tree, spring, summer and fall flower pollens that might be ingested or inhaled.

As a routine, scratch testing should be done with all allergens already noted. Intradermal testing with 1:1200 dilutions of all inhalant allergens is recommended. Elimination diets are used for the study of possible food allergy. The final diagnosis of the allergic causes of asthma depends on the results of treatment.

Treatment.

(1) Inhalment sensitization to certain pollens, animal emanations, dusts, etc., may sometimes be controlled by their elimination from the environment. Usually, desensitization with etiologic allergens is necessary. The initial dose of an antigen should be 0.05 or 0.1 cc. of a dilution that fails to react by the scratch method. Maximum doses can be reached gradually and repeated every two weeks for perennial therapy. Epinephrine hypodermically may be needed to control general reactions.

(2) Food sensitizations are best controlled by the continued elimination of the causative foods.

(3) In cases of suspected bacterial allergy, foci of infection must be sought for. Autogenous vaccines may be prepared from such foci and from the sputum. They are injected subcutaneously, and continued administration of the vaccine every one to three weeks for a year or more may be necessary.

(4) General Therapy.

(a) The hypodermic administration of 1:1000 solution of epinephrine gives the best relief. In doses of 3 to 12 minims, this treatment can be repeated every five to thirty minutes. Inhalation of 1:100 epinephrine is also a very valuable form of therapy in acute attacks.

(b) Ephedrine sulphate in 3/8 to ¾ grains by mouth relieves some patients. The nervousness caused by this drug is reduced by giving barbiturates, or a barbiturate and theobromine.

(c) A saturated solution of potassium or sodium iodide in doses of 5 to 20 drops, two to four times a day is of definite value.

(d) Morphine should not be used.

J. G. W.

ANEMIA DURING SULFANILAMIDE THERAPY.

By W. Barry Wood, Jr., M.D., *Baltimore—J.A.M.A., Vol. III, Nov.* 19, 1938.

Twenty-one cases of acute anemia associated with the administration of sulphanilamide, in a series of 522 patients treated with the drug, were studied. The incidence was higher in children than adults. No definite predisposing factors were noted.

The earliest signs of the anemia appeared between twenty-four and seventy-two hours after the onset of treatment. The maximum anemia occurred usually on the fifth day.

The anemia is definitely associated with acute hemolysis, but the pathogenesis is unknown.

Four out of five patients in whom acute anemia had developed when first treated with the sulphanilamide suffered recurrences when a second course of the drug was given.

Treatment consists in the immediate withdrawal of the drug, the forcing of fluids to increase the rate of excretion of sulphanilamide, and blood transfusions. There have been no deaths reported.

It is important to watch the haemoglobin carefully during the first week of sulphanilamide therapy. J.G.W.

TREATMENT OF PERTUSSIS WITH GOLD TRIBROMIDE.

Choice of Dr. J. Epstein.

Clinic of Dr. J. Epstein. *Stuyvesant Polyclinic—Med. Clinics of North Am., Sept.*, 1938.

The dibromides give better sedative action than the monobromides, and the tribromides are more effective than either. The most suitable tribromide for medicinal purposes is gold tribromide ($AuBr_3$). It is an unstable and easily oxidized compound, but it can be made up in a stable elixir known as elixir bromaurate. The dosage is 1-2 teaspoonfuls.

350 whooping cough cases are reported. 250 were given elixir bromaurate exclusively, and the average duration of their illness was three and eight-tenths weeks. The other 100 were divided into three groups as controls. The average

duration of the illness in this group was ten weeks.

Gold tribromide treatment therefore cuts down the duration of the whooping cough to almost one-third of what it is under other therapeutic measures.

J.G.W.

THE EFFECT OF THE ADMINISTRATION OF SOME CARBOHYDRATE DERIVATIVES ON THE HYPOGLYCEMIC SYMPTOMS OF THE HEPATECTOMIZED DOG.

By F. G. Young, E. T. Waters, J. Markowitz, *and* C. H. Best—*Amer. Jour. Physiol., Nov.* 1, 1938.

When the liver is removed from dogs, the blood sugar falls and hypoglycemic symptoms appear. By the administration of glucose, mannose, maltose, dextrin and glycogen the symptoms can be prevented from appearing. It seems that the last four substances named act by being converted into glucose in the blood.

The author of this paper used hepatectomized dogs. They studied the effect of substances, that had been shown in other experiments to be intermediate products in carbohydrate metabolism, both on the prevention and cure of hypoglycemia due to insulin. They also used ascorbic acid because of its presence in the majority of tissues. They found that the administration of these had no influence on hypoglycemic symptoms. These results point to a peculiar specific action of glucose. The actual mechanism is discussed in the article. The possibilities are (1) glucose has an environmental effect similar to that of K, Ca ions on isolated muscle.

(2) The specificity is due to the glucose, when it is oxidized, unlocking a vital series of chemical reactions necessary for normal function. The authors point out that the inability to cure or prevent hypoglycemic symptoms does not mean that these substances are not intermediaries in glucose metabolism. R.L.M.

PRESSOR SUBSTANCES IN THE CORTEX OF THE KIDNEY.

By B. Friedman, D. I. Abramson *and* W. Marx—*Amer. Jour. Physiol., Nov.* 1, 1938.

A pressor material was found in the alcohol insoluble fraction of a saline extract of renal cortex. It is thermolabile, Section of the cord in the cervical region and evisceration have no detrimental effects upon its action. Thus the pressor substance would seem to act locally on the vessel wall and not through higher centres. It does not act chiefly on the visceral vessels, but generally. The latter observation seems to be substantiated by the fact the substance causes vasoconstriction in a perfused dog's tail. The active material was shown definitely not to contain tyramine, a substance found in some kidney extracts to which other investigators have attributed the pressor effect.

The hypertension following renal ischemia in man and animals may be explained on the hypothesis that the injured kidney releases a chemical stimulus which exerts a generalized pressor effect on the blood vessels and is independent of the central nervous system. The renal pressor substance investigated by these authors would seem to lend support to this view.

R.L.M.

THE MECHANISM OF REGULATION OF THE BLOOD SUGAR BY THE LIVER.

By S. Soskin, H. E. Essex, J. F. Herrick *and F. C.* Mann—*Amer. Jour. Physiol., Nov.* 1, 1938.

Claude Bernard stated that "The normal blood sugar level is the result of a precise equilibrium between the processes of anabolism (sugar formation in the liver) and catabolism (sugar utilization in the tissues.") Proof of this statement has till now been indirect.

The above investigators ligated the inferior vena cava of dogs, causing a rerouting of the blood from the caudal end of the body via a collateral circulation. Thus by means of a thermostrohmur on the inferior vena cava the total blood flow through the liver could be measured. Another thermostrohmur was placed on the portal vein and the venous blood flow could be calculated. The difference of the two gave the arterial flow. With these values and the blood sugar levels in the vessels known, the intake and output of sugar under varying conditions may be calculated. It was found that during control periods the liver secreted sugar into the blood. The intravenous administration of glucose was followed by a cessation of excretion of sugar by the liver and a retention of some of the incoming sugar.

R.L.M.

Book Review

WHAT IS OSTEOPATHY?

By Charles Hill, M.A., M.D., D.P.H., *and* H. A. Clegg, *M.A., M.B., M.R.C.P.* 217 *pages. J. M. Dent & Sons, Ltd., London,* 1937.

This book, written by two prominent London medical men, discusses osteopathy as a system of healing of any or all human ailments, with particular reference to the eligibility of this system to Parliamentary recognition as a science, and to the advisability of professional licensure of its practitioners. The authors' query is of considerable interest to us of the medical profession of Canada, in view of the recent attempt, early in 1938, of osteopaths, chiropractors and other drugless therapists to obtain Provincial legislative sanction of the use of the title of "Doctor," and of the consequent discussion, particularly by the laity, of the validity of their claim to such a professional status.

Osteopathy, we are informed, had its origin in the principles and practise of one Andrew Taylor Still, of Kansas, U.S.A., whose medical knowledge was gleaned from observing his father's work as a physician, from a short period of study at the Kansas City School of Physicians and Surgeons, and from dissection of dead Indians on the Western plains. The death of three of his children from cerebrospinal meningitis in 1864, caused him to revolt from the medicine of his day and to condemn the use of all drugs and sera as therapeutic agents; ten years later in the style of an Old Testament prophet, he proclaimed his discovery of Osteopathy as an independent system of healing, so called because of the importance of the bones in his theory. His basic principle was that, since the human body contained all of the substances necessary for its well-being, all disease was caused by the failure of the arteries, veins, and nerves to conduct properly the fluids of life, obstruction to the flow of these fluids being attributed to the pressure of displaced bones or contracted muscles upon the vessels and nerves supplying the diseased area.

For example, dislocated hips were common according to A. T. Still, and people came to him with various complaints and diseases only to discover that their hips were literally out of joint. "When a hip," he writes, "is thrown out of the socket, and tears, strains, or wounds the tissues, muscles, and nerves, and inhibits the normal action of blood, is it at all surprising to say that this accounts for many diseases that have baffled the skill of the medical world for all ages, such as hysteria, confused menstruation, constipation, bladder and kidney disease, and on up as high as the liver and spleen." The immense disease-producing capacities of dislocated hips, ribs, and clavicles, however, paled under the shadow of the spinal column. Piles, obesity, diabetes, shaking palsy, eczema, debility, St. Vitus' dance, dandruff, and pimples on the face are among the numerous conditions caused by dislocation of the bones of the spine. The treatment for one and all of these diseases was manipulation of the appropriate joint, e.g., neck, ribs, vertebrae, or hips, with reduction of the dislocation and relief of symptoms.

Regarding contemporary medical thought and treatment, Still, affectionately termed the "Old Doctor" by his followers, had little but condemnation and contempt. To him, as late as 1910, all talk of micro-organisms as causative agents of disease was superstition, while he considered life too precious to dilly-dally in laboratory work, analyzing urine, blood, lymph, or other fluid substances of the body. The employment of internal medication, of course, was anathema to the founder of this new system, so that he criticized severely those osteopaths who even sought the aid of medical practitioners.

Since, however, Still's proclamation of osteopathy in 1874, and of his nihilistic attitude toward drugs, vaccination, serum treatment, etc., etc., etc., many changes in the theory and practice of osteopathy have occurred. Still's conception of the rôle of the artery in the production of disease generally, receives little comment in modern osteopathic writings, with more stress now placed on the part played by the nerve, e.g., reflex stimulation, arising in a strained spinal joint, gives rise to nerve impulses to various viscera, e.g., stomach, with production of disease in that organ. Moreover, the teaching of the theory of drugs in osteopathic schools has become quite accepted, and use of drugs in osteopathic practice has become firmly established. However, drugs are considered adjuncts only to orthodox osteopathic treatment, e.g., faucial diphtheria is believed to be best treated by manipulation of cervical vertebrae, with diphtheria antitoxin as an aid, if "conscientiously" felt necessary. Similarly in the treatment of pernicious anemia, liver therapy is considered merely as auxiliary to manipulative treatment of the vertebral column, especially the fifth thoracic vertebra.

The authors, as prominent members of the medical profession in England, then proceed to deal particularly with the claim of modern osteopathy to State recognition of its scientific basis. In discussing this,

their criticism is that osteopathy began with a number of generalizations, not arrived at by the truly scientific inductive method, with the resultant difficulty in making particular instances fit into the theoretical framework so hastily assembled by Andrew Still, in 1874. Osteopathic lesions are conceded never to have been demonstrated at post-mortem examinations. Experimental evidence of such lesions, as cited by the A. T. Still Research Institute, is very unconvincing, and termed such as to be impossible of publication in a decent journal. X-ray evidence of the osteopathic lesion, as presented to the Select Committee of the House of Lords of Great Britain in 1935, when that body was considering the Registration and Regulation of Osteopaths, failed to bear up under close scrutiny and was thoroughly discredited.

In considering the course of instruction given in American osteopathic colleges, the summary of the recent report of Dr. E. Stanley Ryerson, of our own Faculty of Medicine, and Dr. Etherington, Dean of the Faculty of Medicine of Queen's University, following investigation of four prominent osteopathic educational centres in the United States, is given. Reference in this report is made to the inadequacy of their teaching facilities, the inferiority of the requirements for admission and length of their courses, and the lack of acceptability of the scientific training and clinical experience of the members of the teaching staff, all as compared to those of the medical schools of Ontario.

In defence of their system, leading British osteopaths, in the course of their testimony before the House of Lords Committee, insisted repeatedly that, while even admitting they had but little scientific basis for their treatment of certain conditions, beneficial results definitely followed such treatment. This claim is accepted by the authors, but limited chiefly to those cases of joint disease, in which freedom of joint movement is hindered by the presence of adhesions of whatever origin. In this regard, osteopathy approaches the ancient craft of "bone-setting," which has been recognized in England by physicians and surgeons since the early days of the seventeenth century. The psychological effect of manipulation is also definitely recognized, so that when the suggestive power of an emphatic and confident healer works upon a mind that is seeking assurance, is reinforced by the healing power of touch, some temporary benefit is inevitable.

The authors, in concluding, state their conviction that the claim of osteopathy to be a new and complete system of healing is supported neither by argument, by evidence, by observation, nor by experiment. On this basis is built their opposition to State recognition of osteopathy by statutory registration as a science having the same status as medicine. Accordingly the reader is left with the thought that while osteopathic manipulation has its place in the treatment of disease, its field of usefulness is very definitely limited, and that employment of its technique should be permitted only to the osteopath, who is medically qualified to diagnose and treat disease in general.

H.G.S.

THEY ARE HELPING US—HELP THEM

The following is a list of those whose ads. appear in this issue. If you need their products or services, we recommend them to our readers for patronage:

AYERST, McKENNA & HARRISON, LIMITED 110
CANADIAN LABORATORY SUPPLIES, LIMITED 146
FROSST, CHARLES E., & CO. ..... Inside Back Cover
HARTZ, THE J. F. CO., LTD. 151
McAINSH & CO., LIMITED 126
MEAD JOHNSON & CO. OF CANADA ..... Outside Back Cover
MEDICAL AT-HOME DANCE 147
PARKE, DAVIS & COMPANY 109
WINTHROP CHEMICAL COMPANY, INC. ..... Inside Front Cover